An Investigation into What Planning Departments and Water Authorities Can Learn from Eleven Communities' Waterwise Landscaping Ordinances

by

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Executive Summary

Background

Water is different from other resources, in that there is no alternative substance that will meet our needs. Unfortunately, unpolluted freshwater is becoming increasingly scarce worldwide. The earth's population of 5.9 billion people will double in the next 40 to 90 years; however the supply of water on earth will not increase (Simon 1998, 4). In the United States we are using *billions* of gallons more water every day from our lakes, rivers, reservoirs, and wells than is replenished through precipitation, groundwater recharge, and other methods (Ellefson, et. al. 1992, 4). Excessive pumping of groundwater has caused the Fresno, California area to subside 33 feet, has created sinkholes hundreds of yards wide and tens of feet deep in Florida, and has caused saltwater to creep into and pollute wells on both the east and west coasts (Christopherson 1997, 258). Additionally, at least one city in California has had "its bond rating lowered by Standard and Poor's because of water shortages" (Simon 1998, 19). The Southern Nevada Water Authority forecasts that without more water, growth in the area will need to stop by 2010 (Simon 1998, 24).

For most water utilities in areas requiring watering during the growing season, the single largest use of the water they supply is for watering landscapes (Ball and Members 1990, 1). In areas where watering occurs mostly during the summer, approximately one-half to two-thirds of all water delivered to residential areas is devoted to watering landscaped areas (Ball and Members 1990, 3; City of Aurora 1989, 1; Ash 1998, 2). Therefore, in response to the shortage of water and its increasingly high cost, planners and water authorities across the nation are beginning to implement waterwise landscaping ordinances.

Purpose and Methods

The purpose of this report is to provide information on the many options available in waterwise landscaping ordinances, how various ordinance elements are enforced in real life, the advantages and disadvantages of various elements, and landscape architects' and planners' views and recommendations on waterwise landscaping ordinances. Hopefully this information will

make it easier for planners and water authorities to develop comprehensive and effective waterwise landscaping ordinances. The research question was "What can planners and water authorities learn from other communities' waterwise landscaping ordinances?"

This report focuses on ordinances which encourage or require the use of waterwise plants and/or that limit the area of lawns (turf) or offer incentives for reducing turf. While it is beneficial for ordinances to include methods such as regulating the time of day irrigation can occur and requiring best management practices in soil preparation, I believe the source of the water demand problem is that the traditional landscape requires a great deal of water. Therefore, ordinances directly attack the root of the problem (no pun intended!) when they promote the use of less-thirsty plants.

Because the objective is to provide a resource for planners and water authorities, I conducted a thorough literature review. The literature review (Sections II, III, and IV) can be considered a primer on water shortage issues (including the economic benefits of managing demand through water conservation), the relationship between landscapes and water consumption, and the theory and effectiveness of waterwise landscaping ordinances. The geological, biological, social, and economic information in these three sections may be especially helpful to planners and water authorities that must justify the need for waterwise landscaping ordinances to hesitant or skeptical communities.

To ensure some diversity in the sample, I analyzed eleven waterwise landscaping ordinances from eight states, stretching from the west coast to North Carolina.

1. Gilbert, Arizona
2. Glendale, Arizona
3. Santa Rosa, California
4. Las Vegas, Nevada
5. Reno, Nevada
6. Albuquerque, New Mexico
7. Santa Fe, New Mexico
8. Greensboro, North Carolina
9. White City, Oregon
10. Leander, Texas
11. Pierce County, Washington

To allow comparison between ordinances and communities, information about each community (such as the cost of water) and important ordinance elements (such as the limit on high water use plants) are grouped by community and presented in the matrix in Section V.

I also pulled apart the eleven ordinances and categorized their components into twenty-five useful elements (such as parameters for irrigation audits). Therefore, Section VI is a

compendium of waterwise landscaping ordinance elements that ordinance authors may review for possible ideas.

To provide information about the benefits and disadvantages of certain ordinance elements as experienced in real life, I interviewed twelve planners and eight landscape architects from the eleven communities. I was unable to interview the planner from Leander, Texas. I interviewed landscape architects from all eleven communities except Las Vegas, Nevada; White City, Oregon, and Leander, Texas.

I interviewed the planners and the landscape architects about their views on enforcement and specific elements of waterwise landscaping ordinances (such as waterwise plant lists); these interview results are presented in Section VII. Section VIII presents interview information from the planners about the ordinance as a whole (such as the impact on workload or what they think is particularly effective). Section IX contains interview information from landscape architects about the ordinance as a whole (such as the most difficult aspects in meeting the requirements or what their clients think about waterwise landscapes).

Thorough descriptions of the research methodology are in Sections I, VIII, and IX.

Findings

Interviews of landscape architects and planners, and analysis of each community's situation and ordinance in light of this information, were key research components of this report. More findings are presented in the matrix and interview sections, but some general findings include:

Overview of the communities and ordinances

- The eleven communities varied in population size from 5,500 (Leander, Texas) to 478,000 (Las Vegas, Nevada), with a median size of 180,000 people.
- Of the eleven communities, Las Vegas experiences the greatest difference between evapotranspiration and precipitation (-64.4 inches from May to September), while Greensboro, North Carolina receives *more* precipitation than is lost through evapotranspiration.
- The price of 1,000 gallons of water ranged from $0.40 in White City, Oregon to $4.09 in Santa Fe, New Mexico. (During drought and/or summer the price increases to $5.09 through $9.09 in Santa Fe.)

- Three ordinances were adopted or revised in 1993, 1995, or 1996. The other eight have been adopted or revised since 2000.
- Almost all the ordinances apply to all new construction and major remodels. Four ordinances exempt schools, parks, and cemeteries from the turf limits and water-intensive plant limits, and six exempt single family dwellings.
- Eight ordinances set turf limits, ranging from 0% to 50% of the landscapable area. (Turf usually requires more irrigation than other landscape vegetation.)
- The three ordinances that have no turf limits are from three of the four communities experiencing the least difference between summer precipitation and evapotranspiration.
- Eight of the ordinances require the use of waterwise plants. The others only offer incentives or state that waterwise plants shall be "emphasized."
- Four ordinances set limits for the minimum width of turf, which range from five feet to ten feet. (Narrow strips of turf are usually difficult to irrigate efficiently.)
- Eight ordinances require mulching the soil. The required minimum ranges from two to four inches. (One landscape architect stated that requiring a deep mulch is one of the most effective parts of the ordinance.)

Ordinance enforcement

- A concise summary of the ordinance, perhaps in a checklist format, would assist in compliance for landscape architects that work in multiple communities and have difficulty remembering the different requirements in each community.
- On the whole, planners and landscape architects appreciate the presence of the ordinance, even in communities where enforcement is lax, as it initiates an "attitude" of water conservation, and helps the "clueless people."
- Enforcement varies by community. Generally, the more important the community views water conservation, the more the ordinance is enforced. The correlation between enforcement and community attitude appears stronger than the correlation with enforcement and cost of water, population size, or the summer water deficit (precipitation minus evapotranspiration).
- Vigilantly enforcing the waterwise landscaping requirements of the ordinance during plan review has little correlation to work load, "there are just more things to check" on the plan.
- Landscape architects are gratified when landscapes are inspected for compliance with the approved plans, because it ensures that landscapes will be installed they way they designed them. Some landscape architects want to see greater enforcement, particularly more thorough inspections of the installed landscapes.
- The biggest barrier to more thorough inspections of installed landscapes for compliance with the approved plans is a lack of inspectors, especially ones that do "know an oak tree from some other kind of tree."

- Putting the burden of final inspection on licensed landscape architects appears to be a somewhat effective solution. (One landscape architect stated that the developers sometimes pressure him to approve installations which are not in full compliance, and therefore he is "creative" in his letter of certification.)
- Landscape architects are willing to tolerate many requirements as long as the planning department is consistent in enforcement and receptive to exploring alternative methods of compliance when an exception is warranted.

Turf limits and plant lists

- Landscape architects want more flexibility in the turf limits to allow for judgment calls based on the specific project and whether the turf will actually be put to a functional use.
- Two planners and one landscape architect thought single family homes should not be exempt from turf limits, as in the aggregate their landscape water use exceeds that used by other developments.
- A few landscape architects and planners stated that developers want lush landscapes and do not like being constrained by plant lists nor turf limits, whereas other landscape architects and planners stated that developers always want to use waterwise plants and limit turf, because it is more cost-effective to maintain.
- Some landscape architects feel constrained by plant lists, while others have no problem creating a "lush" looking landscape with the permitted plant species and appreciate that they do not need to guess which plants the planning department will deem acceptable. The greater the number of species on the plant list, the more content the landscape architects seemed.
- Plant lists that are not updated at least every three years frustrate landscape architects. Frequent updates are necessary so that landscape architects are not de facto prohibited from using the newest strains of waterwise plants.
- Plant lists developed with input from landscape architects, botanists, and/or nurseries were less problematic.
- It is vital to ask landscape architects for their opinions on the effectiveness of proposed incentives for using waterwise plants. One ordinance's incentive is constantly used, whereas another ordinance's has never been used. (The landscape architect from this latter community said he has no objection to waterwise plants, but implementing the incentive would make his project look worse.)

The most effective elements of ordinances

- Six of the twelve planners cited aspects of their ordinances they thought were particularly effective at conserving water:
  - offering incentives for reusing water (e.g., site runoff, graywater)
  - setting turf limits

    - requiring mulch
    - prohibiting turf on steep slopes
    - allowing required trees to be smaller if they are waterwise
    - requiring efficient irrigation
    - providing waterwise landscaping information
    - defining key words in the ordinance

- Incentives for irrigating with reclaimed water are used often, and are especially popular with larger projects. Landscape architects thought reusing water deserved more emphasis.
- Requiring the distribution of city-provided waterwise landscaping information packets to home buyers and home builders is extremely effective in reducing water use and putting a positive spin on waterwise landscapes.
- Two landscape architects thought that the best aspect of their communities' waterwise landscaping ordinances was the consistent yet flexible manner in which the planning department enforced it.

Attitudes towards waterwise landscaping ordinances

- Of the eight landscape architects, three thought their clients were pleased with the aesthetics of waterwise landscapes, two thought it varied, one thought most clients do not like the aesthetics, and two opined that developers care only about the cost of landscaping and that aesthetics matter little. Regardless of aesthetic opinions, developers appreciate that waterwise landscaping can save them money.
- Landscape architects appreciate the ordinances' requirements, because otherwise developers would pressure them to do whatever is cheapest or to develop a design that ends up wasting water.
- One planner urged involving the building community because otherwise they will be "afraid of change" and shoot down a proposed ordinance even when it is comparable to nearby communities' ordinances. Conversely, another planner stated it was best to totally avoid involving the building community.
- It is helpful to educate stakeholders and the city council on the financial and aesthetic costs and benefits of waterwise landscaping, and to inform them that such ordinances are now mainstream.
- Ordinances tend to be more effective and have greater "buy in" when nurseries, landscape architects, engineers, irrigation contractors, arborists, county extension agents, and others are involved in writing and reviewing them.
- Landscape architects thought one of the best aspects of waterwise landscaping ordinances is that they increase the community's, developers', and landscape architects' awareness of water use. Also, recognizing water shortage as a problem increases community support of waterwise landscaping ordinances.

Recommendations

1. Evaluate your community

The degree of compulsion and the water-reducing aspects of your ordinance should correlate with community values and interests, the legal framework within which your community operates, the physical environment and geographic climate, the political/economic climate, and the degree of water shortage. For example, requiring underground irrigation systems for all new development may be cost effective in hot dry climates, but may not be beneficial in cooler regions which require very little irrigation. Similarly, the longer, hotter, and drier the watering the season, the more water waterwise vegetation will save compared to non-waterwise vegetation.

Political climate may allow for turf limits and water-intensive plant limits to apply to all new construction and major remodels, or it may dictate that single family dwellings are exempt. (This would be unfortunate because in the aggregate the volume of water they use on landscaping exceeds that used by other developments.) Politics may also require compromising on certain elements. For example, perhaps it is more politically acceptable to set no limit on the amount of turf, yet require that all turf must be comprised of warm season species (which is more waterwise than cool season species).

Consider your community's awareness of water conservation. If water conservation is not currently a civic issue in your community, is there funding available for public education? Educating the community about water shortage and efficient water use will help them understand the need for the waterwise landscaping ordinance and help ensure that the ordinance actually saves water. Some of the planners and landscape architects I interviewed from Nevada, New Mexico, and Arizona implied that water conservation is an accepted part of their communities' culture, whereas other studies have indicated that people do not think about water conservation unless there is a drought. My experience with water utilities and water customers in the Pacific Northwest (including focus groups conducted for the water utilities) leads me to conclude that lack of awareness is especially a problem in areas that are naturally green much of the year and have a reputation for being rainy (such as Seattle). Additionally, a few customers in the focus groups had comments such as "I don't believe we're short on water—I drive past the river and I still see plenty of water in it!" There was also a great deal of confusion and skepticism regarding

how water conservation is supposed to save the community money. (The last part of Section II of this report discusses the economic benefits of water conservation. For example, it states that building the additional water infrastructure required to cover peak demand days that happen only once or twice a year is like buying an $80,000 sports car that is driven only once or twice a year.)

Consider how much funding your community wants to allocate to ensuring that the ordinance's requirements are complied with. While planners stated that it takes only a small additional amount of time to review site plans, many communities do not allocate enough money to allow for thorough inspections of the installed landscape. Regardless, even in communities where enforcement is lax, planners and landscape architects appreciate the presence of the ordinance as it initiates an "attitude" of water conservation and helps the "clueless people."

2. Seek input from stakeholders, particularly from landscaping and water professionals

Encouraging community input helps ensure that the ordinance reflects your community's values. Although one planner stated that it was best to not include developers because they will fight almost everything, my analysis leads me to conclude that it is best to include the stakeholders. The ordinances that were written and reviewed with the help of landscape architects, nurseries, engineers, irrigation contractors, arborists, county extension agents, water conservation professionals, and other stakeholders are much more effective and have greater "buy in." The planners and landscape architects who were involved in the formation of such ordinances reported that the process was quite time consuming, however thought the end results are definitely worth the extra effort. Involving stakeholders would have prevented some problems with plant lists, waterwise vegetation incentives, and water re-use incentives that I observed with some ordinances.

Although I did not interview developers, I did ask landscape architects and planners about how developers were responding to the ordinances. They reported that while the occasional developer may not like the aesthetics of waterwise landscaping, developers are most concerned about the financial implications of the ordinances. Creating an even playing field by uniformly enforcing requirements regardless of the developer's status in the community and by keeping your community's ordinance in line with those of nearby communities will help alleviate many developers' concerns.

3. Educate everybody

As stated above, many people do not realize the importance of conserving water. Education is necessary to help them understand both the need for the waterwise landscaping ordinance and how conserving water will financially benefit them. Planners I interviewed stated that it is also helpful to educate the city council on such issues, and to also inform them that the ordinance you're proposing is relatively mainstream for your region.

Additionally, most research has shown that one of the biggest barriers to waterwise landscaping reducing water use to the full extent possible is that people irrigate waterwise landscapes more than is required. Therefore, educating homeowners, landscape managers, and others about appropriate irrigation will increase the benefits reaped from a waterwise landscaping ordinance. My research for this and other reports indicates that high water prices are excellent in creating water customer awareness and encouraging conservation.

Create a positive attitude about waterwise landscaping. Some communities have beautifully designed demonstration gardens and awards for houses and commercial buildings with the best looking waterwise landscapes. Some of the landscape architects I interviewed stated that many modern landscaping installations are interchangeable and have no sense of place, and that the landscaping outside a hotel in California may look almost identical to that in Massachusetts. Because many waterwise landscapes make good use of native plants, waterwise landscapes can help impart a regional character and local identity to neighborhoods and businesses. Recognizing the value of promoting landscaping that is both waterwise and filled with the area's native plants, some communities now refer to these landscapes as "heritage landscapes."

4. Carefully organize the ordinance

Ordinances that are well organized are easier to comprehend and easier to comply with. While conducting my research I read almost thirty ordinances and was struck by the importance of simple differences in organization. Some of the difficulties I experienced were also echoed by some of the landscape architects and planners I interviewed. For an excellent discussion of features that *any* landscaping ordinance should contain, see the American Planning Association's

Preparing A Landscaping Ordinance by Martz with Morris. (This source is included in this report's "Cited References.")

Important tips that may not be obvious to all ordinance authors:

- Clearly state that one of the purposes is water conservation. Even better, include one sentence about the region's water shortage.
- Define all the words that you do not want to debate the meanings of later. Put these definitions in the same section, not in a section eighty pages previous.
- Do not write the entire ordinance in capital letters, even if other sections are. It is difficult to read quickly.
- Attempt to keep all landscaping requirements in one section. Some communities scatter their requirements under multiple sections, such as "Land Development" and "Water Conservation." If you must separate the requirements, clearly state which other sections contain additional related requirements.
- Create a concise summary of the ordinance, perhaps in a checklist format. This will increase the compliance of landscape architects who work in multiple communities and have difficulty remembering the different requirements in each community.

5. Include these most important ordinance elements

As stated above, an element that is practical in one community may not be practical in another community. With that said, certain elements seem to be especially worthwhile to consider. These include:

- *Alternative methods of compliance.* This allows for ingenuity in creating water-efficient designs and would greatly reduce some of the frustrations landscape architects felt.
- *Waterwise plant requirements or incentives.* One incentive that has proven to be effective is allowing required trees to be smaller in diameter if they are waterwise.
- *Waterwise plant lists.* The more extensive and the more frequently updated, the happier the landscape architects will be. Landscape architects and nurseries should help develop the list. Clearly state if the plant list is required or recommended. Clearly state if exceptions are sometimes allowed, and if so, describe the process used.
- *Turf limits.* Turf may require almost twice as much water as other vegetation. If possible, don't make single family homes exempt from turf limits, as in the aggregate their landscape water use exceeds that used by other developments. Of the eleven ordinances studied, eight had turf limits, ranging from 0% to 50% of

the landscapable area. Four ordinances set limits for the minimum width of turf; these ranged from five feet to ten feet. (Normally, the narrower the turf strip the more difficult it is to irrigate efficiently.) Discourage or prohibit turf on steep slopes.

- *Mulch.* Very effective at reducing water needlessly lost from the soil. Within reason, the deeper the mulch the better.
- *Regulation of man-made water features.* The evaporation from waterfalls, fountains, ponds, and other water features can be significant.
- *Reclaimed water incentives.* Some communities offer financial incentives or permit more turf to be installed if a development uses gray water or site runoff.
- *Information packets.* Requiring the distribution of city-provided waterwise landscaping information packets to home buyers and home builders increases the perceived value of the landscaping and helps reduce unnecessary irrigation.
- *Prohibition against covenants, conditions, and restrictions requiring water-intensive landscaping or prohibiting waterwise landscaping.* This helps prevent a wide range of legal problems for both the planning department and individuals interested in waterwise landscaping.

It should again be noted that this report focused on landscaping ordinances that encourage or require the use of waterwise plants and/or that limit the area of turf or offer incentives for reducing turf. Because the focus was on the vegetation planted, I offer no recommendations on such issues as regulating the kinds of irrigation systems permitted, regulating the time of day (and/or day of week) that watering is allowed, or regulating how much water is permitted to be used based on the landscape footprint and evapotranspiration rates ("water budgeting"). Considering the fact that many people unknowingly or carelessly over-irrigate waterwise landscapes, such elements are certainly important to consider including in an ordinance.

More research is necessary to determine how ordinances may most effectively reduce the amount of water consumed by landscapes while maintaining landscape aesthetics, economic efficiency, and community values. However, it is logical to reason that because landscape irrigation consumes a great deal of water, decreasing our landscapes' water requirements will help reduce water consumption. Therefore, ordinances that encourage or require waterwise landscaping in new developments play an important role in extending the horizon of our water supply.

Section I. Introduction

The Water Supply Problem and the Purpose of this Study

Water is different from other resources, in that there is no alternative substance. Unfortunately, unpolluted freshwater is becoming increasingly scarce worldwide. The earth's population of 5.9 billion people will double in the next 40 to 90 years; however the supply of water on earth will not increase (Simon 1998, 4). By 2050, between 48 and 60 countries (containing between 2 billion and 7 billion people) will not have enough water (World Water Assessment Programme 2002, 10). In the United States we are using *billions* of gallons more water every day from our lakes, rivers, reservoirs, and wells than is replenished through precipitation, groundwater recharge, and other methods (Ellefson, et. al. 1992, 4).

As a result of the quest for diminishing supplies of groundwater, saltwater is creeping into and polluting wells on the east and west coasts, while in Florida the emptying aquifers are caving in, becoming sinkholes hundreds of yards wide and tens of feet deep.

Excessive pumping of groundwater has caused the Fresno, California area to subside 33 feet, and yet water demand in California is expected to increase 37% over the next 25 years (Christopherson 1997, 258; Ash 1998, 2). The Metropolitan Water District of Southern California, which serves 16 million people, estimates that by 2010 "the existing water supply will meet only 43 percent of the demand for the district" (Simon 1998, 19). Also, at least one city in California has had "its bond rating lowered by Standard and Poor's because of water shortages" (Simon 1998, 19). The Southern Nevada Water Authority forecasts that without more water, growth in the area will need to stop by 2010 (Simon 1998, 24).

For most water utilities in areas requiring watering during the growing season, the single largest use of the water they supply is for watering landscapes (Ball and Members 1990, 1). In areas where watering occurs mostly during the summer, approximately one-half to two-thirds of all water delivered to residential areas is devoted to watering landscaped areas (Ball and Members 1990, 3; City of Aurora 1989, 1; Ash 1998, 2). Therefore, in response to the shortage of water and its increasingly high cost, planners and water authorities across the nation are beginning to implement waterwise landscaping ordinances.

Waterwise landscaping ordinances take various forms: regulating the kinds of irrigation systems that can be installed; regulating the time of day that watering is allowed; soil preparation requirements; regulating the size of man-made waterfalls; limits on total area of turf (which requires more water than most other vegetation); prohibiting narrow strips of turf (which are difficult to water efficiently); encouraging or requiring the use of plants which need little water (henceforth called "waterwise plants"). This report focuses on ordinances which encourage or require the use of waterwise plants and/or that limit the area of turf or offer incentives for reducing turf. Specifically, the research question was: What can planners and water authorities learn from other communities' waterwise landscaping ordinances?

This is an important question because planners and water authorities in the United States are increasingly considering adopting ordinances that reduce the amount of water required by landscaping. Despite such burgeoning interest, because this is a relatively new field there is little collected or organized information on waterwise landscaping ordinances. My conversations with planners indicate that they often end up "reinventing the wheel." Searching for waterwise landscaping ordinances to emulate, and then actually obtaining a copy, takes quite a bit of effort. Additionally, although some state and academic institutions host "model ordinance" websites, I found few with ordinances pertaining to reducing water use in the landscape, and even fewer with ordinances that attempt to reduce water use through regulating the type of vegetation (the focus of this report).

Planners and water authorities can learn a great deal from other communities' waterwise landscaping ordinances. This report presents some of the options available in waterwise landscaping ordinances and provides analysis that will help planners draft more comprehensive ordinances and understand the benefits and/or disadvantages of certain elements. This report also investigated the degree to which the ordinances are abided by and enforced. However, an empirical evaluation of the effectiveness of these ordinances is beyond the scope of this report.

Overview of Literature Review

The mainstream and scientific literature indicate that nations all over the world are currently facing or will face water shortages. In the United States we are using billions of gallons more water every day than is replenished by the hydrological cycle, causing serious economic, biological, and geomorphic ramifications. For these and other reasons, water resource

planners in many communities have expanded their focus to include decreasing the demand for water, and not merely increasing the supply. Increasing efficiency and encouraging conservation is often the cheapest way to decrease the demand for water, which has the effect of extending the water supply.

The biggest water savings can often be found in the areas of biggest water use. Water applied to landscaping is the single largest use of the water supplied by most water utilities. Thus, reducing the amount of landscape planted in thirsty plants (including turf) and increasing the amount of waterwise plants can greatly reduce the landscaping's water needs, especially in warm, dry regions. Waterwise landscaping offers many benefits to property owners, water customers, tax payers, and wildlife.

Waterwise landscaping ordinances are "a relatively inexpensive method of ensuring that new landscapes are as efficient as possible" (Chaplin 1994, 19). However, to actually reduce water use, waterwise landscaping ordinances must first be comprehensive and well written, then be enforced by planners and complied with by landscapers and developers, and finally the landscape caretakers need to irrigate the landscape appropriately. Unfortunately, research by more than a few firms and individuals indicates that heedless of the landscape's needs, people often overwater. This is reportedly best remedied through better education and higher water prices. Research also indicates that there is room for improvement in the first two factors—ordinance quality and enforcement/compliance—which are the focus of this report.

Methods

To address the research question "What can planners and water authorities learn from other communities' waterwise landscaping ordinances?" this study analyzed the waterwise landscaping ordinances of eleven communities as well as the interviews of the planning department staff and landscape architects in most of these communities.

Selection of the ordinances

To determine which communities were likely to have waterwise landscaping ordinances, I examined newspaper articles, journal and magazine articles, books, pamphlets, and web sites, as well as spoke with and e-mailed planners and water resource authorities. (Thus, waterwise ordinances that have not received attention from printed or electronic media sources were less

likely to be represented in this report, although two ordinances were obtained through "word of mouth.") I developed a list of approximately thirty cities that potentially had waterwise landscaping ordinances. Most of the ordinances I obtained regulated the methods and/or hours of landscape irrigation, however, did not mention waterwise plants or turf limits. I discarded such ordinances, as they did not fit the criteria for inclusion in this study. Additionally, if I was unable to obtain a copy of the ordinance, then I did not include the community in my study.

The sampling method is not random. However, the relative rarity of landscaping ordinances addressing waterwise plants would have resulted in a high exclusion or "discard" rate. Thus, generating a random sample would have been less efficient and more time-consuming than warranted by the intent of this study.

Many factors important to the development and enforcement of waterwise landscaping ordinances (such as political inclination, summer temperature, summer precipitation, population growth, price of water, etc.) vary by region. Therefore, I included ordinances from as many states as time, and my sanity, would allow. This study analyzes eleven ordinances from eight states, reflecting some regional variation: Washington (Pierce County), Oregon (White City), California (Santa Rosa), Nevada (Las Vegas and Reno), Arizona (Gilbert and Glendale), New Mexico (Albuquerque and Santa Fe), Texas (Leander), and North Carolina (Greensboro).

Interviews

I interviewed eleven planners and one water conservation officer from ten of the eleven communities, and eight landscape architects from eight of the communities. Each interview was conducted by telephone and lasted 11 to 46 minutes. To encourage freedom of expression, I told the planners I would keep their names confidential and omit identifying details from their statements. I told landscape architects that they could decide at the end of the interview if they did not want their names acknowledged, but regardless I would omit identifying details from their statements. Of the twenty people interviewed, nineteen seemed willing to share their honest views on the subject—some doing so in great detail.

With the interviews I sought to determine issues such as how the ordinances impact planning departments' and landscape architects' work loads, how each profession thinks the ordinances could be improved, and what landscape architects' clients think about the ordinances' requirements. Lists of the interview questions as well as more details on the interview methods

are in “Introduction and Methods” of Sections VIII and IX, the planner and landscape architect interviews.

Limitations of This Report

The method of obtaining the names of communities thought *potentially* to have waterwise landscaping ordinances systematically limits the presence of ordinances from communities that have not had their ordinance mentioned in books, journals, magazines, newspapers, or web sites. Applicability of findings may also be limited in that it is likely that communities that currently have waterwise landscaping ordinances differ in important respects from communities that do not. Additionally, the landscape architects and planners who agreed to cooperate with the interview may differ in important respects from the Las Vegas, Nevada landscape architect and the Leander, Texas planner who never replied to my numerous phone calls and emails.

Delimitations of this Report

As mentioned earlier, the variety of ordinances examined is constrained by this study’s focus. Only ordinances which encourage or require the use of waterwise plants and/or that limit the area of turf or offer incentives for reducing turf are analyzed in this report. However, when those ordinances contain certain other methods for reducing water use on landscapes (e.g., requiring irrigation efficiency audits), then these elements are also presented and analyzed.

This report focuses on the ordinances and planners’ and landscape architects’ reactions to and insights on the ordinances. As such, I did not seek to determine the impact of waterwise landscaping ordinances on the effectiveness of reducing the volume of water applied to landscaping.

Overview of Report’s Structure

Sections II, III, and IV review the current literature. Because the objective of this report is to provide a resource for planners and water authorities interested in developing a waterwise landscaping ordinance, I conducted a thorough literature review, which could be considered a primer on background issues. The geological, biological, social, and economic information in these three sections may be especially helpful when the need for waterwise landscaping ordinances must be justified to hesitant or skeptical communities. Section II brings to light the

serious consequences we are facing as our water supply is increasingly unable to meet our demand, and discusses how it would behoove us to manage our demand through water conservation. Section III describes the history and water requirements of traditional landscapes and the benefits of waterwise landscapes. Section IV discusses the theory behind waterwise landscape ordinances, presents some of the variety in such ordinances, and offers some observations on waterwise landscaping ordinances by planners, landscape architects, landscape contractors, and developers.

Section V contains a matrix that compares the eleven ordinances and communities. Information about each community (such as the cost of water) and important ordinance elements (such as the limit on high water use plants) are grouped by community.

Section VI is a categorization of twenty-five waterwise landscaping ordinance elements (such as parameters for irrigation audits) extracted from the eleven ordinances. People developing ordinances can review this compendium for possible ideas.

Section VII contains planners' and landscape architects' views on enforcement and their thoughts on specific elements (such as waterwise plant lists).

Section VIII contains interview information from the planners about the ordinance as a whole (such as the impact on workload or what they think is particularly effective).

Section IX contains interview information from landscape architects about the ordinance as a whole (such as the most difficult aspects in meeting the requirements or what their clients think about waterwise landscapes).

The Appendix contains graphs of the eleven communities' average summer precipitation, evapotranspiration, and water deficit (evapotranspiration minus precipitation).

Section II. Literature Review: The World's Water Supply, Water Shortages and Consequences, and Managing Demand

The World's Limited Water Supply

Our health, our economy, the health of the environment, and our way of life are all dependent upon a continuing supply of fresh, uncontaminated water. Water is different from other resources, in that there is no alternative substance. Unfortunately, unpolluted freshwater is becoming increasingly scarce worldwide. The earth's population of 5.9 billion people will double in the next 40 to 90 years; however the supply of water on earth will not increase (Simon 1998, 4). Additionally, per capita world water consumption is increasing twice as fast as the world's population (Simon 1998, 4). By 2050, between 48 and 60 countries (containing between 2 billion and 7 billion people) will not have enough water (World Water Assessment Programme 2002, 10).

Increasing populations are straining the already limited water supply. Consider the Middle East, which in 1960 had a supply of 906,000 gallons of water per capita annually, but will have only 176,000 gallons per capita by the year 2025 (Simon 1998, 4). We have seen that our regional shortages in the United States have led to legal battles between various states competing for river water. Globally, water shortages experienced by mutually antagonistic countries will have much more serious consequences. In the late 1980s U.S. intelligence services identified ten places where water shortages could lead to actual war, and the number has grown since (Simon 1998, 4). It is interesting and pertinent to note that the word "rival" originates from the Latin *rivalis*, meaning "one who uses a stream in common with another."

Decrease in Groundwater Supply

Many communities all over the world rely on underground aquifers to fulfill their water needs. However, all over the world aquifers are rapidly being depleted because of excessive pumping. The groundwater in many areas of the Middle East accumulated over thousands of years, however so much is being withdrawn that it will likely run out by 2007 (Christopherson 1997, 256). A similar problem is being faced in the U.S., where from 1950 to 1990 annual

groundwater withdrawal increased 160% (Christopherson 1997, 252). The amount of groundwater we use in the United States is unsustainable: every day we pump out an average of 82 billion gallons of water, although "only 61 billion gallons are replaced each day through rainfall and runoff" (Ellefson, et. al. 1992, 4).

Large areas in the Midwest, West, lower Mississippi Valley, Florida, and eastern Washington chronically pump more groundwater than is restored (Christopherson 1997, 255). In many of these places, the water table has fallen by more than 40 feet (Christopherson 1997, 255). It is daunting that such trouble is facing the Ogallala aquifer, which is used to irrigate about one-fifth of all U.S. cropland (Christopherson 1997, 257). The Ogallala aquifer is the largest known aquifer in the United States, and stretches through eight states from South Dakota to Texas (Christopherson 1997, 257). So much water has been mined from the Ogallala aquifer that in the 1980s the water table was dropping an average of six feet every year, and now the water table is more than 100 feet lower than forty years ago (Christopherson 1997, 257). In Floyd County, Texas, the water table was about 55 feet below the surface in 1940, and by 1984 it was 250 feet below the surface (Christopherson 1997, 258). If present irrigation practices continue, by 2020 half of the Ogallala aquifer will be destroyed by this water mining and the resultant crushing and subsidence of the land (Christopherson 1997, 257).

Subsidence

One problem with groundwater being mined faster than it is replaced (other than the obvious issues of a diminishing supply) is that as the water table falls, water becomes much more expensive to pump up to the surface. Another problem with groundwater being mined faster than it is replaced is subsidence. This, perhaps more than anything else, should alert people to the fact that we are running short of useable water supplies. We are apparently so short of water, in fact, that people are willing to let the ground under businesses and houses collapse as part of the price of obtaining the groundwater.

When communities pump more water from the ground than is replaced, the fluid pore pressure between grains is reduced. This causes the grains to become more compact, and often eventually results in subsidence of the ground surface. By the late 1970's this had already caused hundreds of millions of dollars in damages to buildings, pipelines, roads, bridges, and

railroads, as well as drastic problematic changes in stormwater drainage patterns (Dunne and Leopold 1978, 11, 227).

For many years Mexico City has been pumping out more groundwater than is replaced. Between 1891 and 1959, as a result of groundwater mining almost the entire city subsided at least 13 feet, and some areas subsided 25 feet (Easterbrook 1999, 191). Mexico City's opera house has settled more than 10 feet, and "half of the first floor is now below ground level" (Easterbrook 1999, 191). In California's Central Valley, an area of more than 3,800 square miles had subsided more than 12 inches as of the late 1970s, due to groundwater mining (Dunne and Leopold 1978, 229). Over-pumping of groundwater has caused New Orleans to subside more than 13 feet below sea level, and the Fresno area of California to subside 33 feet (Easterbrook 1999, 191; Christopherson 1997, 258). Additionally, the lowering of the water table has caused large, sudden collapses in many communities in Florida (Easterbrook 1999, 200). Some of these sinkholes are hundreds of yards wide and tens of feet deep.

Pollution Further Limits Water Supply

When there is less water in lakes, rivers, and aquifers it means that pollution entering the water body is more concentrated, which increases treatment costs and can further limit the amount of affordably obtained water. The supply of groundwater available to fulfill our water needs is decreasing due to industrial, agricultural, and residential pollution, as well as saltwater contamination. Because most groundwater is slow-moving, once aquifers are polluted they remain contaminated virtually forever. When too much water is mined from an aquifer near an ocean or saline lake, saltwater is drawn towards the aquifer and pollutes it, rendering it useless as a freshwater source.

The Persian Gulf states have been overpumping their groundwater to the extent that saltwater has encroached into aquifers tens of miles inland (Christopherson 1997, 259). Saltwater intrusion has also polluted wells on the Oregon and California coast, as well as wells on the coasts of Texas, Florida, Georgia, and the northeastern seaboard (Miller 1995, 272). Even wells in the inland city of El Paso, Texas, and on islands in the Seattle area are increasingly brackish due to the huge demand on this diminishing resource (Ellefson, et. al. 1992, 6, 256). Rising ocean levels due to global warming will threaten increasingly inland wells with saltwater penetration.

Desalination is possible; however it requires large amounts of energy and is therefore quite expensive. For example, in 1998 the water desalinated at a Santa Barbara plant cost $6.00 per thousand gallons, although the national average price paid by consumers at the time was about $2.01 (Simon 1998, 124, 121). Thus, many regions are facing both *economic* water scarcity and *physical* water scarcity.

Smaller Snowpack Size is Limiting Water Supply

Many communities rely on the rivers fueled by the melting of snowpacks in the mountains. Unfortunately, global warming is decreasing this source of water worldwide, as more precipitation is falling in bursts of rain instead of snow that is stored until a warmer season. In 2003 University of Washington researchers announced that the warming climate of the past 50 years has been reducing the Pacific Northwest's snowpack, with decreases of 60 percent in some moderate elevation areas (Hines 2003, 21). Because of global warming, the world's snowpacks are also melting increasingly early in the year, and thus less water will be available in the summer, when it is most needed by farmers and man-made landscapes (Hines 2003, 22). One scientific model predicts that global warming will reduce the May through September river flow to Everett (pop. 80,000), Washington's reservoir by 33 to 48 percent (Hines 2003, 22).

If similar decreases in snowfall and earlier onset of snowpack melting occurs nationwide or worldwide, summer water shortages will increase drastically, with negative impacts on farmers, owners of non-waterwise landscapes, and the wildlife that depends on habitat kept alive by river water.

Feeling the Pinch

Due to the vagaries of the hydrological cycle, regional water supply may fluctuate from season to season, year to year, or decade to decade. Increasingly, the trend has been towards dry conditions in most of the United States. "Droughts have intensified in the last 80 years or so in both severity and frequency, and their range has expanded to encompass nearly the entire United States" (Ball and Members 1990, 9). In the Fall of 2003, Southern Nevada Water Authority's website stated that **"**The Colorado River system is facing the worst drought on record." Places that are used to receiving ample precipitation, such as New England, are also "vulnerable to extended periods of dry conditions and drought" (MWRC 2002, 3).

Areas such as the reputedly "wet" Pacific Northwest have a yearly "summer drought" which strains the water supply. In 1998 the people of Eugene, Oregon used record amounts of water (mostly for landscape irrigation) on several occasions, and "water demand came close to eclipsing water supply" (EWEB 1999).

Water scarcity is a frequent concern in some parts of the country. At least one city in California has had "its bond rating lowered by Standard and Poor's because of water shortages" (Simon 1998, 19). It is worrisome to note that the California Department of Water Resources stated: "For the first time in recent history, Californians are finding that existing water systems are no longer able to provide sufficiently reliable water service to users" and that water shortages will become chronic (Ash 1998, 2). Despite the current inadequacy, demand in California is expected to increase 37% over the next 25 years (Ash 1998, 2). The Metropolitan Water District of Southern California, which serves 16 million people, estimates that by 2010 "the existing water supply will meet only 43 percent of the demand for the district" (Simon 1998, 19). New development in an area may be contingent upon if there is enough water available to meet existing and new demands. The city manager of Kyle, Texas believes that the "perception of Kyle having an inadequate water supply has hurt economic development efforts" (Greenwood 2003). The Southern Nevada Water Authority forecasts that without more water, growth in the area will need to stop by 2010 (Simon 1998, 24).

What can be done when the current water supply is deemed inadequate for future needs? As a new method of increasing the available supply, some communities in Arizona, California, Florida, and Texas are employing such tactics as re-using wastewater to meet their burgeoning demands, which has met with some public resistance (Hoffbuhr 2003). Instead of increasing the supply, perhaps we need to consider decreasing our demand. Many communities are realizing the practicality of transitioning from solely managing water supply to also focusing on water demand management.

Economic Benefits of Managing Demand (Water Conservation)

Over the last century water management in the United States has traditionally focused on increasing the supply as the demand increased. Communities built reservoirs, drilled wells, diverted rivers, and drained lakes in their search for more water. However, the earth's water

supply is finite, and the closer we creep to the limit the higher the economic, ecological, and political price.

Forward-thinking communities have progressed past the tunnel-vision focus on supply management, and are increasingly employing tactics to also manage demand, such as encouraging more efficient water use. For the most part, water conservation is a "low-hanging fruit." Educating people about water resource issues and encouraging them to use water more efficiently is usually a cost-effective means of reducing demand, which in effect increases the water supply available for other needs, which means money does not need to be spent on expensive and environmentally destructive efforts to develop more water supply (Ball and Members 1990, 1; U.S.G.S. 1998, 64). Additionally, a decrease in water demand usually also decreases the treatment, distribution, and operating costs of water facilities, both now and in the future. "Conservation becomes more valuable over time because future water supplies and the facilities needed to deliver them are expected to cost more (even when adjusting for inflation)" (EPA 1998, 38).

Even in areas with plenty of water, a reduction in *peak* demand (such as caused by summer watering of landscapes) will save money. Facilities that treat and deliver drinking water are sized to meet peak demand. If a water system can more than adequately meet average day demand, but intense lawn watering causes "needle peaks" every summer that stretch the system's capacity (as is now occurring in many communities), the community will have to pay for the system to expand to cover those few peak days. Those few peak days end up costing the community millions of dollars, which has been likened to buying an $80,000 sports car that sits in the garage and is used only a few times a year. If the needle peaks are reduced through public education and conservation, then the capital costs associated with new facilities are avoided, postponed, or reduced.

As our water supply becomes increasingly strained, more communities are finding that boosting conservation is the cheapest way to obtain additional water resources (Padgett 2003; Chaplin 1994, 4). Increasing the water efficiency of our landscapes can alleviate both peak and base demand for water utilities "and should be considered equivalent to developing new supply projects such as dams and reservoirs" (Chaplin 1994, 1).

Section III. Literature Review: Landscaping's Relation to Water Use

Water Use on Landscaping

The amount of economically obtainable fresh water on earth is decreasing, but the area being converted to landscaping and then requiring irrigation is increasing. In California alone it's estimated that between 500,000 and 750,000 acres of land will be converted to landscaping between 2000 and 2020 (Ash 1998, 19-20). Areas in landscaping are likewise increasing in many other states.

The biggest water savings can often be found in the areas of biggest water use, and landscape irrigation definitely uses a significant portion of many communities' water supply. For most water utilities, "the single largest use of the water they supply is for maintenance of landscapes at residences, businesses, parks, schools, and recreational areas" (Ball and Members 1990, 1). For example, about 50 percent of all water used in the Denver/Aurora metro area and Las Vegas Valley is for irrigating landscaped areas (City of Aurora 1989, 1; Padgett 2003, E1). In the summer in some areas of the West, urban landscape irrigation accounts for more than two-thirds of all water delivered (Ball and Members 1990, 3). Even in "wet summer" places, such as Massachusetts, landscape irrigation makes many communities' water demands double in the summer (MWRC 2002, 2).

Keeping landscapes, especially lawns, green is also a major component of residential water use. In many climates the average household uses 40 percent to 75 percent of its water on landscaping (Ash 1998, 18; Simon 1998, 134; Padgett 2003).

It is increasingly difficult to obtain the large amount of water that landscape irrigation requires. Even in such a seemingly unlikely place as Massachusetts, "Maintaining adequate water supplies during summer months has become a critical problem" and some Massachusetts towns have imposed restrictions on landscape irrigation (MWRC 2002, 20). Thousands of other towns across the United States have also imposed restrictions on landscape irrigation, especially during droughts. However, instead of simply limiting the *irrigation* of landscapes (which can have negative consequences, such as plant death and fire danger), it is more pro-active to attack the source of the problem—the landscape itself.

The Status Quo Landscape

The typical landscape of lawn with foundation plantings came to us from Old England, where there is actually enough rain during the summer to keep the grass green.

> "Medieval English lords cut the forest away from castle walls so that enemies could not sneak up on them. Shorn of their trees, the hillsides sprouted grass. The resulting cover was kept mowed by grazing cows and sheep. And in time the idea of a princely estate came to be a castle set in a carpet of short-cropped green. In less belligerent times, country manors kept the lawns and grass sidled up to the walls of suburban cottages" (Steinhart 1991, 26).

Wealthy settlers on the Atlantic seaboard copied the luscious lawns of England, which by the 1920s were popularly viewed as "emblems of nobility and ease" (Steinhart 1991, 27). When people spread west across the continent they brought their notions of desirable landscaping with them. Unfortunately, year-round lush green lawns were, and still are, incompatible with the notable lack of summer rain typical west of the continental divide.

Potential Evapotranspiration

The hydrological requirements of many landscapes planted nowadays are inappropriate for the climate in which they are situated. Without supplemental irrigation, many of these landscape plantings (especially many lawn grasses), would lose so much more water than they absorbed that they would die, or at least go dormant. The amount of water that *would* evaporate and transpire from plants given adequate precipitation and soil moisture is called potential evapotranspiration, often referred to as simply "ET" by water utilities and gardeners (Christopherson 1997, 243).

Water utilities publicizing ET amounts every week during the summer normally make their reference ET that of a typical lawn in the area, because lawns typically require more water than all other landscape plantings. Therefore, in most communities ET is considered to be the number of inches of water a lawn must receive in a given week in order to continue growing. As Table 1 indicates, lawn (or "turf") is one of the most thirsty types of landscape plantings, while shrubs, trees, and native plants tend to require much less water. For example, if the ET for one week in August in Eugene, Oregon is "1.6 inches," this means that the typical lawn in full sun requires a total application of 1.6 inches of water that week to remain green. During this

same week, shrubs in full sun require only about 0.8 inches (50% of 1.6 inches) and purple coneflower (a waterwise native perennial) requires less than 0.8 inches.

The average summer ET, precipitation, and "water deficit" (ET minus precipitation) values for the eleven communities whose ordinances were studied for this report are listed in Table 2, "Matrix Comparing the Eleven Communities and Ordinances" in Section V. Graphs in the Appendix compare these values for the different communities.

Table 1. Landscape Plantings' Estimated Water Needs

Plant Type	Water Requirements	Compared to Reference ET (100%)
Turf – cool season	High / Medium High	80 – 100 %
Turf – warm season	Medium High	60 – 80 %
Annuals	Medium / High	60 – 100 %
Groundcovers	Medium / Medium High	50 – 80 %
Shrubs	Medium / Low	50 %
Trees	Medium / Low	50 %
Natives	Low	50 % or below

Source: University of California Cooperative Extension, via Ash 1998, 30.

Minimizing Turf Use Can Reduce Water Use

Research at Lawrence Berkeley Laboratory cited in an EPA report suggests that "a typical community could increase its total vegetated area while simultaneously reducing water use significantly, primarily by replacing turf areas with trees and groundcover" (Chaplin 1994, 13). The Southern Arizona Water Resources Association estimates that 3,000 square feet of turf uses between 9,000 and 15,000 gallons of water per month, whereas the same area "planted with groundcover plants, shrubs, and trees, requires only 800 to 1,300 gallons of water per month" (91 percent less) (Richard 1993, 15). Because turf tends to require so much more water than other landscape plants, some communities seeking to reduce water use have limited the amount of turf allowed in a landscape. Some experts state that turf is "the most obvious and important target of most water conservation landscape efforts" (Ball and Members 1990, 15).

Turf is considered such a liability by the Southern Nevada Water Authority that in 2001 it started offering homeowners 40 cents per square foot (with a $1,000 maximum) to replace their lawn with waterwise native plants (Orecklin with Schwartz 2001, 56). In 2003, after four years

of continued drought, the Southern Nevada Water Authority increased the amount to $1 per square foot (Padgett 2003). Similar financial incentive programs exist in California, Nevada, New Mexico, and Arizona.

"Practical Turf Areas" is one of the "Seven Xeriscape Principles" of the National Xeriscape Council.© (The other six principles are Planning and Design, Soil Analysis, Appropriate Plant Selection, Efficient Irrigation, Use of Mulches, and Appropriate Maintenance.) The National Xeriscape Council believes that turf should not be treated as the default fill-in material, and should instead be used only where it has a practical function (such as in recreation areas) or where it aesthetically highlights buildings or other landscape features. "Formally maintained and irrigated turf areas create the highest water use in landscapes. Physically limiting the square footage of turf to areas of functional use or to areas near entryways or other locations with frequent visual contact is an easy, quick way to reduce water need without sacrificing important visual impact" (Ball and Members 1990, 15). (Many ordinances have a "mini-oasis" provision which allows the landscaper to designate a small section of the landscaping for irrigation-intensive plants.)

Although almost all species of turf have "Medium High" or "High" water requirements (as seen in Table 1), some species can more readily withstand drought and go dormant when it is hot and dry. Some communities' ordinances limit the type of grass that can be planted to these less thirsty and more resilient grass species. "Picking the *correct* species of turf for the site can make the difference in watering levels. Bahia and Bermuda are good choices for non-irrigated areas; although they may brown considerably during a severe drought, these grasses will green back up after the first rains. New varieties of St. Augustine, such as FX10, and Buffalograss also appear to be good choices in some parts of the South" (DeFreitas 1993, 6). The U.S. Department of Agriculture has also developed "a new strain of crested wheatgrass that needs only about one-third of the water required by most lawn grass" and also requires less mowing because it grows slower (Chaplin 1994, 35).

Some ordinances do not allow turf to be used in narrow planting strips, because the more narrow the strip the more difficult it is to irrigate efficiently (Ellefson, et. al. 1992, 46). This is because the design of underground irrigation systems employs sprays of overlapping circles, half circles, and quarter circles to ensure complete, more uniform coverage. Due to the geometry of how these spray circles overlap, and the need to water to the "weakest point," some areas of the

turf will always receive much more water than other areas, which is a waste of water. The problem of uneven water distribution and wasted water becomes worse the narrower the landscaped area:

> "John Olaf Nelson of the North Marin Water District (California) made a study of the water requirements of areas based on shape. He found that *areas with the same square footage need increasingly more water as the perimeter increases*. For instance, a ten- by fifty-foot (the typical area between houses) area contains five hundred square feet and has a perimeter of 120 feet. A twenty-three- by twenty-three-foot square area has a little over five hundred square feet and a perimeter of ninety-two feet. Nelson found that more irrigation water was applied to the rectangular area than the square area to keep it green" (Ellefson, et. al. 1992, 45-46) [emphasis added].

Benefits of Waterwise Landscapes

Landscapes in general have many benefits. Quality landscapes can increase property values of the average home by twenty to thirty percent and reduce the time it takes to lease a vacant building (City of Aurora 1989, 1; Robinette 1992, 5). Landscapes can offer seasonal color, buffer obnoxious noise and light, screen undesirable views, reduce erosion, improve air and water quality, provide wildlife habitat, and offer energy savings from reducing wind chilling and heat loss in the winter as well as energy savings from providing shade in the summer. Vegetation also moderates daily temperatures by absorbing sunlight and releasing moisture. Well designed landscapes are psychologically pleasing and can increase community pride (as well as profits). All of these benefits can be obtained by both traditional landscapes and by waterwise landscapes (also known as "xeriscapes©").

The main drawback of waterwise landscaping is a possible compromise in one's aesthetic values. Many people would prefer to use more water and have all the rhododendrons, hydrangeas, lily-of-the-valley, hostas, fuchsias, and lawn they want, as opposed to significantly reducing their water bill by planting waterwise plants such as red-flowering current, ocean spray, iris, lavender, rock rose, lamb's ears, red hot poker, thyme, cosmos, calendula, and crocus. However, if people are willing to use less thirsty plants and reduce turf areas, they may find that waterwise landscapes offer many benefits.

Customers can save money on their water bills. Maintaining waterwise landscapes versus traditional landscapes can result in water savings of 20 to 80 percent (Ellefson, et. al. 1992, 4). Because most water utilities are non-profit and separate the charges for the cost of

basic water service from the cost of actual water used, lower water consumption will result in a lower water bill. Customers' distant future water bills will also be lower, due to delayed, reduced, or avoided infrastructural upgrades, as discussed in the previous chapter. Unlike "traditional supply projects, such as dams and reservoirs, efficiency projects can be implemented incrementally, often eliminating the need for bond financing" (Chaplin 1994, 10).

Less energy is used. Reducing the amount of water landscapes require also reduces "the energy required to treat and pump water and to supply the fertilizers and chemicals necessary to maintain highly irrigated landscaped areas" (Ball and Members 1990, 6). Because less energy is consumed, air pollution associated with its generation will also be reduced.

Nearby asphalt erodes less. Landscape water flowing onto walkways, streets, and parking lots erodes the paved surface (Ash 1998, 10, 13, 18). Therefore, reducing the amount of water a landscape requires can reduce the amount of water flowing onto other areas, and thus preserve the integrity of the paved surface and reduce repair costs. A pilot waterwise landscape at the Denver Water Department "reduced water runoff that was continually damaging asphalt surfaces" (Ball and Members 1990, 5). The City of Aurora, Colorado also found that "asphalt road surfaces require less frequent repair when adjoining properties are efficient in water use" (Ball and Members 1990, 6).

Engineers in Aurora found that the excess water from narrow strips of turf next to roadways and along medians "reduced the expected lifetime of the roadway surface by seventy-five percent and that repairs from general fund taxes are costing $237,600 per mile" (Ball and Members 1990, 67). Switching from turf to waterwise plants would extend road repair cycles and reduce "demand on tax-supported general city funds. In addition, erosion and storm-drainage problems can be moderated" (Ball and Members 1990, 6).

Regional character can be enhanced. Many modern man-made landscapes are interchangeable and have no sense of place. Landscaping outside a house or hotel in California may look almost identical to that in Massachusetts. Because many waterwise landscapes make good use of native plants, they can help impart a regional character and local identity to neighborhoods and businesses. Recognizing the value of promoting landscapes that are both waterwise and filled with the area's native plants, some communities are referring to these landscapes as "heritage landscapes."

Waterwise landscapes fare better during droughts. As the incidence of drought is increasing in more areas of the United States, more communities are regulating how much, how often, and when landscapes can be watered. When Santa Fe, New Mexico recently suffered its worst drought in fifty years, homeowners were allowed to water lawns and gardens only once a week. Naturally, landscapes that were planted in consideration of Santa Fe's annual precipitation average of 12 inches fared much better than those dependent on frequent watering. During drought, landscapes "that are designed with water demands more closely aligned with natural precipitation tend to succeed or suffer less loss" and thus look more attractive than non-waterwise landscapes (Ball and Members 1990, 9).

Maintenance costs can be reduced. While lawns generally require more maintenance than other forms of landscaping, waterwise landscaping usually requires less maintenance. A waterwise landscape installed at city hall in Fort Collins, Colorado cut annual maintenance costs by 50 percent, while a 7,000 square foot waterwise landscape at Denver Water Department reduced landscape maintenance costs by $100 a year (Ball and Members 1990, 5).

Another example of savings in landscape maintenance costs is at two AT&T office parks in Chicago. In 1993 the company spent $2,000 per acre annually to maintain its 50 acres of turf. (This figure includes irrigation, fertilizing, pesticides, mowing, etc.) In 1993 a landscape architect spent $2,000 per acre to convert 18 acres to waterwise native prairie, therefore, the very first year the company broke even. Annual maintenance costs for the converted area decreased to less than $500 per acre, one-quarter the previous cost. Pleased with the results, AT&T promptly converted more than 30 additional acres of turf to waterwise prairie. As of 1998, AT&T was saving approximately $72,000 per year in maintenance costs (Rocky Mountain Institute 1998, 140).

The City of Arvada, Colorado also realized savings by employing waterwise landscaping along a major arterial. In 1980 the city had made the mistake of planting the 3.8 acres on West 80th with bluegrass turf and regularly spaced trees, at a cost of $1.78 per square foot. Irrigation was expensive, irrigation runoff deteriorated the asphalt, and irrigation water on the road caused at least one accident. (The excess water eventually required the installation of underdrains at a cost of $175,000, however the asphalt damage continued.) A year later the city landscaped along another major arterial, West 58th, however this time no turf was used in the median, the turf in the roadside was a type requiring 50 percent less water than bluegrass, and all the trees, shrubs,

flowers, and groundcovers required very little water. The landscaping on the 4.2 acres cost $2.15 per square foot to install, which is $68,000 more than if the cost had been $1.78 per square foot (the cost of the West 80th project). However, the comparison of annual costs for the two sites from 1983 to 1987 demonstrate that although the waterwise site was 10 percent larger, it cost 56 percent less to maintain. For the five year period, "Materials and Labor" and "Water" costs for the smaller, traditionally-landscaped site were $35,736 and $24,813, respectively, versus only $17,484 and $9,241 for the larger, waterwise landscaped site (Ball and Members 1990, 66-67).

Installation costs may be comparable to that of traditional landscapes. The installation costs of the aforementioned waterwise landscaping project in Colorado were higher than the non-waterwise project. However, the California Department of Water Resources states that the cost of installing water-efficient landscapes during new construction or renovations can "easily be the same or less than for installing conventional landscapes" (Chaplin 1994, 6).

Less water is required. Waterwise landscapes can save 20 to 80 percent of the water used on traditional landscapes (Ellefson, et. al. 1992, 4). The 7,000 square foot pilot relandscaping project at Denver Water Department saved 162,926 gallons of water annually, which "freed enough capacity to permit the sale of an additional service tap on the system valued at nearly $2800, plus additional water-sales revenue of $145/year" (Ball and Members 1990, 5). A former Goleta (California) Water Conservation coordinator estimated that waterwise landscaping requirements for all new construction in Goleta Water District led "to a 50 percent reduction in water use for landscaping" (Rocky Mountain Institute 1998, 229). In California's East Bay Municipal Utilities District (EBMUD), Richard Bennett of EBMUD estimated that "landscape standards will reduce water use in new construction by approximately 25 percent over conventional landscapes," while tests conducted by EBMUD on actual landscapes found that landscape water use was reduced by 90 percent (Rocky Mountain Institute 1998, 229). However, it should be noted that the personnel maintaining these landscapes were specially trained, and the 90 percent reduction rate is considered too optimistic to apply to the general public (Chaplin 1994, 20).

It must be noted that although less water is *required* by waterwise landscapes, it is extremely common for homeowners and landscape caretakers to overwater them.

Wildlife habitat can be preserved. The less water that is used to irrigate landscapes, the more water that remains in lakes, rivers, and wetlands which provide habitat for wildlife. Additionally, reductions in water use also reduce the amount of chemicals and energy used to treat and transport the water, which also has positive benefits for wildlife habitat. Waterwise landscapes also tend to require less fertilizer and herbicide than traditional landscapes (one study indicates 61 percent less and 22 percent less, respectively), which reduces the amount of these chemicals released into the environment (Nelson 1990, 221).

Because we consume a great deal of water irrigating our landscaping, decreasing the water requirements of our landscaping can greatly reduce our need to acquire new water supplies. Therefore, ordinances that encourage or require waterwise landscaping in new developments play an important role in extending the horizon of our water supply. Waterwise landscaping ordinances may be initially "essentially local in their impacts," however, "the cumulative, positive effect of many such projects will ultimately produce community-wide and regional benefits over the long term" (Arendt 1999, xx).

Section IV. Literature Review: Waterwise Landscaping Ordinances

The Variety in Water Conserving Landscaping Ordinances

Many states have communities with ordinances that are meant to reduce water use on landscapes. The degree of compulsion and the water-reducing aspects of the ordinances correlate with community values and interests, the legal framework within which the community operates, the physical environment and geographic climate, the political/economic climate, and the degree of water shortage. These factors help determine the appropriateness of the various tactics ordinances may employ. For example, requiring underground irrigation systems for all new development may be cost effective in hot dry climates, but may not be beneficial in cooler regions which require very little irrigation. Communities' ordinances also vary in length and importance. While many water conserving landscaping ordinances are prominently featured in sections titled "Landscaping," others are put into less obvious sections titled "Water Conservation," "Utility," etc.

The tactics ordinances employ may take many forms:

- regulating the kinds of irrigation systems that can be installed
- regulating the time of day (and/or day of week) that watering is allowed
- regulating how much water can be used, based on the landscape footprint and ET rates ("water budgeting")
- requiring irrigation efficiency audits
- prohibiting watering of hardscape (sidewalks, parking lots, roads)
- encouraging or requiring that only recycled water be used for irrigation
- requiring separate water meters for landscaping
- requiring certain soil preparations (how much compost, how deep to till the soil)
- regulating the size of man-made waterfalls and swimming pools
- limiting the total area of turf
- prohibiting certain species of turf
- prohibiting the installation of turf during hot weather months
- prohibiting narrow strips of turf (which are difficult to water efficiently)
- encouraging or requiring waterwise plants

As stated in the Introduction, this report focuses on ordinances which encourage or require the use of waterwise plants and/or that limit the area of turf or offer incentives for reducing turf. While it is beneficial for ordinances to include such methods as regulating the time of day irrigation can occur and requiring best management practices in soil preparation, I believe the source of the water demand problem is that the traditional landscape requires a great deal of water. Therefore, ordinances directly attack the root of the problem (no pun intended!) when they promote the use of less-thirsty plants.

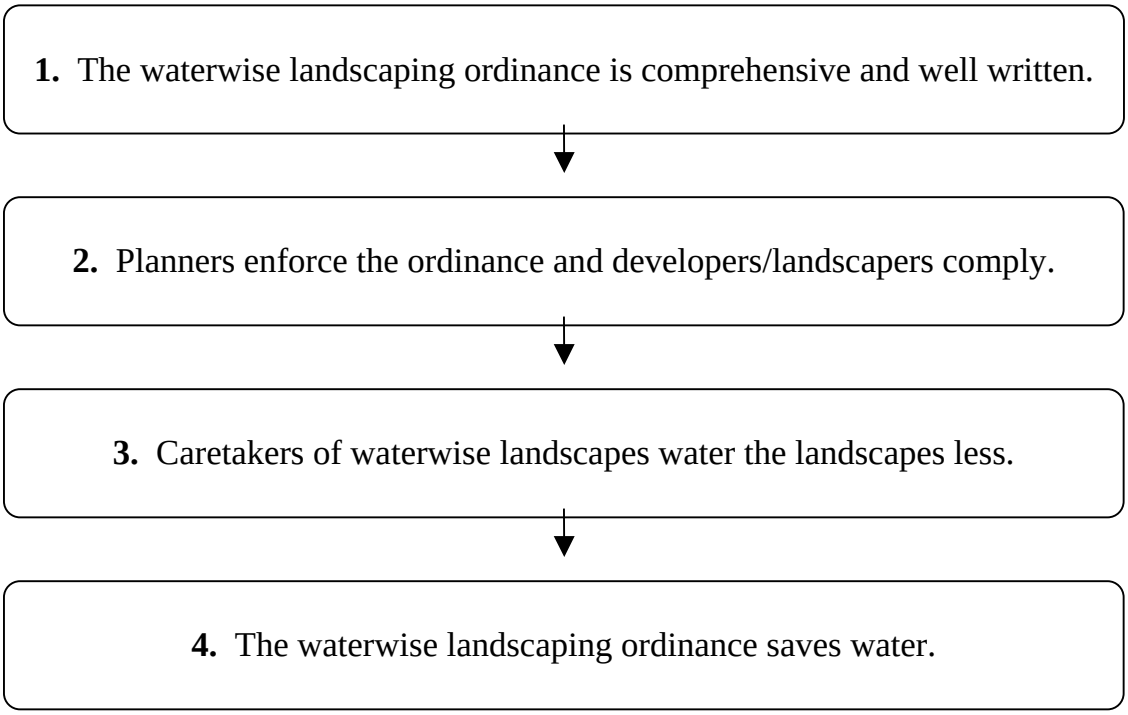
The Theory Behind Waterwise Landscaping Ordinances

It would be advantageous for many homeowners, business owners, and developers to install waterwise landscaping, and doing so would also benefit the community. Although "people react favorably to a program that educates and helps them solve problems while preserving personal choices," financial incentives promoting landscape water efficiency, demonstration gardens, and community awards for best-looking waterwise landscapes only go so far (Ball and Members 1990, 33). Thus "many communities have found that legal mandates are necessary," despite the fact that many "people view regulation as an imposition and enforcers as taking away their freedom" (Chaplin 1994, 19; Ball and Members 1990, 33). From the community's perspective, "design requirements are a relatively inexpensive method of ensuring that new landscapes are as efficient as possible" (Chaplin 1994, 19).

The point of waterwise landscaping ordinances is to reduce the amount of water used on landscapes. It is a well accepted fact, by definition and design, that waterwise landscapes *require* less water than traditional landscapes. However, whether waterwise landscaping ordinances succeed in reducing the total amount of water consumed by landscaping is a different matter. Several assumptions must hold true in order for a waterwise landscaping ordinance to be effective in reaching its intended goal (Figure 1).

(1) The waterwise landscaping ordinance is comprehensive and well written. Enforcement and compliance, even existence of the ordinance, may matter little if the ordinance does not require much and/or is not well written. Ordinance quality varies. A 2001 Western Policy Research study compared approximately 150 Californian communities' water efficient landscape ordinances to the state's Model Water Efficient Landscape Ordinance. The study found that "weaknesses in the structure of many ordinances" is a major problem and that "the

Figure 1. Theory of How Waterwise Landscaping Ordinances Reduce Water Use



Source: Author.

overall level of efficacy lies roughly halfway between fair and good" (Bamezai, et. al. 2001, v, 16).

(2) Planners enforce the ordinance and developers/landscapers comply with the ordinance. According to the sampling of approximately 150 ordinances in California, 92 percent of the agencies responding to the mailed survey verified compliance between the approved plans and the installed landscapes (Bamezai, et. al. 2001, v, 9).

(3) Caretakers of waterwise landscapes water the landscapes less. Research by more than a few firms and individuals suggests that item (3) is the biggest obstacle to waterwise landscapes actually saving water. The water industry saying is: "A waterwise landscape doesn't save water; the person watering it does (or does not)." Stakeholders interviewed indicated that due to very cheap water and no agency monitoring, "maintenance contractors rarely irrigate accurately no matter how efficient the design" (Bamezai, et. al. 2001, v). For example, Doug Bennett, conservation manager for Southern Nevada Water Authority, stated that they "have a significant number of customers who don't make any changes in their [outdoor use]. What

they're doing in June they do in January. It's opening the bill that gets their attention, not why we should conserve" (Padgett 2003). Educating and involving local landscape managers can also help ensure that landscapes are watered only the amount they need, and not more, as successfully demonstrated in Santa Barbara, California (Chaplin 1994, 15).

(4) The waterwise landscaping ordinance saves water. Of Western Policy Research's 51 responding planning agencies with either an ordinance, resolution, or design guidelines, 14 (27%) surveyed thought that the ordinance *will not significantly reduce* the community's water demand (Bamezai, et. al. 2001, 9). The main reasons cited were "weak enforcement" and that the ordinance was not often invoked because the community was already "built out" (Bamezai, et. al. 2001, 9). Slightly more respondents, 17 (33%), thought the ordinance *will significantly reduce* the community's water demand, while 20 (39%) did not know (Bamezai, et. al. 2001, 9).

Feedback from Professionals in the Field

The aforementioned Western Policy Research study of the water efficient landscape ordinances of approximately 150 Californian communities included interviews of planners, landscape architects, landscape contractors, developers, and irrigation consultants. (Western Policy Research's findings largely correlate with the scenarios and sentiments expressed by the planners and landscape architects I interviewed for this report.)

Pertinent themes from Western Policy Research's approximately 36 interviews of all these various professionals in California:

- The interviewees thought water is too cheap, and that the best tool to encourage conservation is the higher cost of water.
- Most interviewees thought people do not think about water conservation unless there is a drought. *Conversely, a few of the landscape architects and planners I interviewed from Nevada, New Mexico, and Arizona implied that water conservation is part of their communities' culture* (Bamezai, et. al. 2001, 13, 14).

Pertinent findings from the interviews of planners:

- Planners are satisfied with their ordinances and implementation and "did not recommend making any major changes to existing ordinances or guidelines."
- Some jurisdictions do not have enough staff to do "a final inspection after installation to insure compliance with approved plans," and therefore require

landscape architects to do the final inspection and then submit certification of compliance (Bamezai, et. al. 2001, 13, 14).

Pertinent findings from the interviews of landscape architects:

- "Landscape architects appear to applaud the spirit and intent" of waterwise landscaping ordinances.
- They "did not recommend making any major changes to existing ordinances," although some found it difficult to comply with the many different requirements of various jurisdictions and thought ordinances should be standardized.
- Many landscape architects thought plan checkers were too detail-oriented and rigid, and lost sight of the design as a whole.
- Most landscape architects thought "maintenance contractors overwater regardless of design efficiency" (Bamezai, et. al. 2001, 13, 14, 16).

Pertinent findings from the interviews of developers and landscape contractors:

- Developers and landscape contractors feel little impact from the ordinances.
- Developers stated they rely on landscape architects to make sure local ordinances are complied with (Bamezai, et. al. 2001, 13, 14).

As depicted in Figure 1, the quality of the ordinance itself is vital to the end goal of saving water—ordinances that require little will save little. Therefore, the comprehensiveness of ordinances and any misunderstandings regarding ordinance requirements was a major focus of my research. The second assumption that must hold true for waterwise landscaping ordinances to save water is that planners need to enforce the ordinance and landscape architects need to comply. Thus enforcement of all the various requirements of the studied communities' ordinances, as well as planners' and landscape architects' views on enforcement, was another major focus of my research.

Western Policy Research's findings suggest that developers and landscape contractors feel little impact from waterwise ordinances, while planners and landscape architects feel the greatest impact. Therefore, I interviewed only planners and landscapes architects for this report.

Section V. Matrix of the Eleven Communities and Their Ordinances

Introduction

Table 2 in this section is a matrix that compares the eleven communities and some of the more important elements of their ordinances. (For more details on each community's ordinance, see Section VI "Categorization of the Eleven Ordinances' Elements.") The communities are arranged in order from greatest average summer water deficit (Las Vegas) to least (Greensboro). This arrangement enables one to see the general correlation between summer water deficit and the strictness of landscaping requirements: the requirements tend to decrease as the summer water deficit decreases. Other information on the matrix, such as the cost of water in the community and year the ordinance was adopted or revised, may also help planning departments compare these ordinances to what may be appropriate in their own communities.

Community Factors

As can be seen in Table 2, the eleven communities' populations varied greatly, from 5,500 (Leander, Texas) to 478,000 (Las Vegas, Nevada), with a median value of 180,000 people. The price of 1,000 gallons of water ranged from $0.40 in White City, Oregon to $4.09 in Santa Fe, New Mexico. (During drought and/or summer the price increases to $5.09 through $9.09 in Santa Fe.)

Weather station data indicate that for the months of May, June, July, August, and September, Las Vegas experiences the greatest difference between evapotranspiration (ET) and precipitation (-64.4 inches), while Greensboro, North Carolina actually receives 1.3 inches *more* precipitation than is lost through evapotranspiration (Table 2). However, such numbers do not tell the whole story of water shortage in a community. For example, "Greensboro came close to running out of water for its customers because of extreme drought conditions" during the summer and fall of 1998 (Finkbeiner, Pettis & Strout, Inc. 2002). Factors other than ET, such as booming development, population pressure, falling water tables, and pollution of the water supply, also play a role in the supply of water available in a community. However, when considering implementing a waterwise landscaping ordinance, it is important to note the ET

deficit; the greater the ET deficit, the greater the potential benefit of waterwise landscaping. (Figures 2, 3, and 4 in the Appendix are graphs depicting the eleven communities' summer precipitation, summer evapotranspiration, and summer water deficits.)

Ordinance Components

Citing the purpose

Obvious goals of landscaping ordinances are enhancing a community's visual and environmental quality and protecting property values. When there is an additional specific intent of an ordinance, such as water conservation, it is helpful to clearly state that. Of the eleven ordinances studied, all but three cited efficient water use/water conservation as a goal. Gilbert's ordinance is titled "Article VIII Water Conservation Ordinance" and thus the intent can be inferred. White City's and Greensboro's landscaping ordinances contain no purpose statements whatsoever, nor any mention of water shortages or droughts. (Although it would not be evident to anybody reading the ordinances, the planners from these communities stated that water conservation was an important reason for the recent changes to the ordinances.)

Applicability and exemption

The kinds of developments the water-conserving features of the ordinances apply to are listed in Table 2. Almost all the ordinances apply to all new construction and major remodels. Four ordinances exempt schools, parks, and cemeteries from the turf limits and water-intensive plant limits, and six exempt single family dwellings. (A few landscape architects interviewed stated that they wished single family dwellings *weren't* exempt, because their water demand is quite high. Conversely, a few planners stated they did not have the desire, the time, and/or the staff to review the landscape plans of single family dwellings.)

The Elements

For more extensive details on the ordinances' requirements than provided in Table 2, see Section VI "Categorization of the Eleven Ordinances' Elements." For planner's and landscape architects' views on the specific elements and their enforcement, see Section VII "Planner's and Landscape Architects' Views on Enforcement and Elements of the Ordinances."

Table 2. Matrix Comparing the Eleven Communities and Ordinances

COMMUNITY FACTORS	
Community	**Las Vegas, NV**
Population in 2000	478,000
Cost of 1,000 gallons water *	Tier 1: **$1.05**, Tier 2: **$1.75**, Tier 3: **$2.38**, Tier 4: **$3.02**. Number of gallons per tier depends on meter size.
Total average E.T. for May, June, July, Aug., Sept.	65.76"
Total average precip. for May, June, July, Aug., Sept.	1.41"
Total average summer water deficit (E.T. - precip.)	**64.4"**
ORDINANCE COMPONENTS	
Year adopted or revised	1997, revised 2002
Water shortage cited as problem	No
Water conservation or efficiency cited as goal	Yes
Applicability **	C, Retail, Ind., Instit., Office, and MF. SF projects with 5 or more lots adjacent to collector or larger streets.
Exempt from turf and/or water-intensive limits	Schools, parks, cemeteries
Waterwise plants -- required or incentive?	Required
Limit on high water use plants (annuals, containers, etc.). Includes turf where noted.	50% of non-turf landscapable area within 3 years. 0% of sidewalk buffers.
Limit on non-drought resistant cool-season grass	25% of L. area in C and Ind. 0% in public facilities. 30% in MF. 50% of total front yard area in certain SF. Golf courses: 5 acres avg. per hole with max. 10 addit. acres for driving range.
Limit on drought resistant cool-season or warm-season grass	same as above
Minimum width of turf	-
Soil tilling / amending	-
Soil mulching	Required
Automatic irrigation system overspray / run off	Discouraged / Prohibited
Plants with similar water needs grouped together / irrigated separately	- / -
Incentives or exemptions for irrigating with reclaimed water	-
Water or landscaping terms defined in *this* section	0

* Prices listed are for those kinds of development to which the ordinance applies.

** The ordinances apply only to new (and in some cases, expanded) projects. The exception is Las Vegas, where MF projects "may be required to comply" retroactively.

2	3
Glendale, AZ 219,000	**Reno, NV** 180,000
$1.22 winter, **$1.81** summer excess	0-6K: **$1.56**, 6-28K: **$2.43**, 28+K **$2.90**
50.29" 3.30"	44.02" 1.96"
47.0"	**42.1"**
1996 No Yes	2000 No Yes
1) All new projects and some remodels or expansions except SF and two-family. 2) Areas next to a 6' screening wall on the property line that backs or sides onto a street.* Schools, parks, cemeteries, golf courses	All new projects or remodels or expansions except: SF homes and projects where existing vegetation to be retained meets or exceeds requirements. -
Required	Waterwise plants shall be "emphasized." Required trees shall be drought-tolerant
(Includes turf.) 20% of landscapable area in excess of 10,000 sq.ft. 20% of L. area in excess of 20,000 sq.ft. for hotels/motels.	Low water use plants shall be emphasized
20% of landscapable area in excess of 10,000 sq.ft. 20% of L. area in excess of 20,000 sq.ft. for hotels/motels.	50% of L. area in C., Ind., model homes, MF.
same as above	same as above
-	8'
- Required	Required / Required Required under trees and shrubs
Prohibited	-
- / -	- / -
Exemption	-
6 (of 7 total)	0

* Different requirements for these categories.

4	5
Gilbert, AZ 110,000	**White City, OR** 5,500
0-20K: **$0.82**, 20-30K: **$1.07**, 30K+: **$1.21**	0-15K: **$0.40**, 15+K: **$0.58** **(cheapest)**
42.35" 2.0"	35.25" 3.31"
40.4"	**32.0"**
2000, will be revised by 2005 No Indirectly	November 2003 No Indirectly
1) SF & MF. 2) Model homes. 3) Non-residential.* If 10+ acres: schools, parks, cemeteries, golf courses, public recreation facilities, common areas of housing developments.	Developments that cannot obtain irrigation water from a municipal or community water system. -
Required	Required
(Includes turf.) 10% of L. area of Common Area in SF & MF. 20% model homes. Non-resid. by formula.	0% of landscapable area
10% of L. area of Common Area in SF & MF. 20% model homes. Non-resid by formula. 0% all rights-of-way.	25% of landscapable area
same as above	same as above
-	5'
- Encouraged	- / - Required
Prohibited	Discouraged
- / -	Encouraged / -
Incentive	-
11 (of 13 total)	0

* Different requirements for these categories.

6	7
Albuquerque, NM 449,000	**Santa Rosa, CA** 148,000
$1.59, **$1.87** summer excess	**$2.43**
34.08" 5.28"	28.73" 1.59"
28.8"	**27.1"**
1995, revised 2001 No Yes	1993, revised 2004? No Yes
All uses except SF residential. -	C, Ind., Instit., Office, park & greenbelt, developer installed MF, and common areas of SF. When functional need: schools, parks, cemeteries, golf courses, playgrounds, sports fields.
Required	Required
0% of city owned development other than parks, golf courses, and housing. 20% of L. area in city owned housing and all non-city owned properties (except golf courses). Parks & golf courses: high water use turf and plants only in heavy use areas.	40% of landscapable area
same as above	40% of landscapable area
-	50% of landscapable area
-	8'
- -	Required / Required Required
Prohibited	Prohibited
- / -	Required / Required
Encouraged	Exemption
29 (of 39 total)	18 (of 19 total)

8	9
Leander, TX 8,000	**Santa Fe, NM** 62,000
$3.60	**$4.09**, when drought and/or summer **$5.09** to **$9.09** **(most expensive)**
38.37" 16.69"	28.08" 8.42"
21.7"	**19.7"**
2002 Yes Yes	2001 Yes Yes
All uses except cemeteries -	All uses, including remodels/additions over $80,000 or 1000 sq.ft. When functional need: public parks and commercial recreation areas
Required vegetation must be chosen from city's plant list, wherein 70 of 76 plants are waterwise.	Waterwise plants shall be "emphasized."
-	High water use plants shall be "limited."
- (but drought resistant grass encouraged)	The lesser of 10% of lot area or 1,000 sq.ft.in SF. 20% of required common open space in MF. The greater of 1,000 sq.ft. or 3% of required open space in C and Ind.
-	-
-	10'
Required under turf / Required under turf Required	- Required
Discouraged	Prohibited
- / -	Required / Required
-	Exemption when 3 day/wk. watering restrictions
0	0

10	11
Pierce County, WA 320,000 (unincorp. areas of county)	**Greensboro, NC** 224,000
(Multiple providers) 0-10K: **$0.74 to $1.14**, 10-20K: **$0.87 to $1.40**, 20K+: **$0.87 to $1.74**	Resid. 0-7K: **$1.60**, 7-22K: **$2.21**, 22-45K **$2.94**, 45+K **$3.68**; Non Resid. **$2.21**
14.46" 6.46"	11.08" (July, Aug., Sept. only)* 12.40" (July, Aug.,Sept. only)
8.0"	**-1.3"** (July, Aug., Sept. only)
1995 Yes Yes	2003 No No
1) All projects requring a permit. 2) Any interested project. 3) All except SF.	All uses, including some expansions, except: SF detached homes on resid. zoned lots, two-family homes on their own lots, MF with 8 or less units on one lot, properties in the Central Business District.
-	-
Incentive, except turf shall include drought-resistant varities	Incentive--trees, Required--shrubs
-	-
-	-
-	-
10' encouraged	-
Encouraged / Encouraged Encouraged	Required / Required Required
-	-
Encouraged / Encouraged	Encouraged / -
-	-
0	0

* Different requirements for these categories.

* E.T. wasn't recorded *anywhere* in N.C. until June 2003. These figures are from 2003, which the State Climate Office said was average to slightly cool/wet.

Section VI. Categorization of the Eleven Ordinances' Elements

Introduction

Communities attempting to write their own waterwise landscaping ordinances and justifying the elements therein are often interested in learning what other communities have done. The following categorization of the elements from the eleven ordinances will help in this regard. (The eleven ordinances are from Gilbert, Arizona; Glendale, Arizona; Santa Rosa, California; Las Vegas, Nevada; Reno, Nevada; Albuquerque, New Mexico, Santa Fe, New Mexico; Greensboro, North Carolina; White City, Oregon; Leander, Texas; and Pierce County, Washington.) The texts of all eleven ordinances total more than a hundred pages—too many to include—however, excerpts from the ordinances are included when warranted.

The details below expand upon some of the basic information outlined in the matrix of the ordinances (Table 2), and also cover new topics. Referring back to the matrix will help put some of the elements detailed below in perspective in regards to community size, summer water deficit, year the ordinance was adopted or revised, etc. Details about the enforcement of these elements, as well as planners' and landscape architects' comments about some of these elements, are in Section VII, "Planners' and Landscape Architects' Views on Enforcement and Elements of the Ordinances."

The focus in the categorization below, as it is in this entire report, is on waterwise vegetation. However, also included are other ordinance elements that are of interest to planners seeking to promote efficient water use on landscapes, such as soil preparation, reclaimed water use, irrigation efficiency, and waterwise landscaping literature distribution.

The categorization does not contain elements from "drought ordinances" or "water emergency ordinances," which apply intermittently. It also does not include information regarding watering restrictions (such as number of days per week or gallons per 1,000 sq.ft. of landscaping), even when such restrictions may be part of the regular landscaping ordinance.

The 25 elements categorized below

1. General Applicability
2. General Exemptions
3. Turf Limit Exemptions
4. Maximum Landscapable Area in Turf (or any water intensive plants)
5. Maximum Width of Turf

6. Grass Type/Species
7. Plants Selected in Non-High-Water Areas
8. Plant List
9. The Intent of Plant Guidelines
10. Incentives for Using Waterwise Plants
11. Soil Tilling
12. Soil Amending
13. Mulching of Exposed Soil Surfaces
14. Dealing with Slopes
15. Water Harvesting
16. Incentives for Irrigating with Reclaimed Water
17. Grouping Plants with Similar Water Needs
18. Separate Irrigation Circuits Required
19. Direct Application Methods
20. Spray Irrigation
21. Irrigation System Provisions
22. Irrigation System Audits
23. Alternate Means of Compliance
24. Information Packets
25. Good or Interesting Ideas

All the ordinances apply only to new and (in some cases) remodeled or expanded developments. The exception is Las Vegas's ordinance, which states that multi-family developments "may be required to comply" retroactively.

General Applicability

Ordinances that list different kinds of development

A. Office/Commercial. (**Gilbert**) (**Las Vegas**) (**Santa Rosa**)
B. Industrial. (**Gilbert**) (**Las Vegas**) (**Santa Rosa**)
C. Institutional. (**Gilbert**) (**Las Vegas**) (**Santa Rosa**)
D. Parks and greenbelts. (if less than 10 acres: **Gilbert**) (**Santa Rosa**)
E. Hotels and motels. (**Gilbert**) (**Glendale**)
F. Model homes. (**Gilbert**)
G. Common areas of multi-family residential. (**Gilbert**)
H. Developer-installed landscaping in multiple-family residential. (**Las Vegas**) (only non-private areas: **Santa Rosa**)
I. Non-private or common areas of single-family residential. (**Gilbert**) (**Santa Rosa**)
J. Single-family developments "with five or more lots adjacent to streets classified as collectors or larger." **(Las Vegas**)

Ordinances that don't list different kinds of development

K. All uses <u>except</u> single-family residential. (**Albuquerque**)
L. All uses <u>except:</u> single-family detached dwellings on residentially zoned lots, two-family dwellings on their own lots, multi-family dwellings with 8 or fewer units on a single lot, properties in the Central Business District. (**Greensboro**)
M. All uses, including some remodels and expansions, <u>except</u> single-family residences. (also <u>except</u> two-family residences: **Glendale**) (**Reno**)
N. All uses, including "additions or remodeling of existing structures that disturb greater than 1000 square feet of land area, or have a valuation of over $80,000." (**Santa Fe**)
O. All uses <u>except</u>: cemeteries. (**Leander**)
P. Developments that cannot obtain irrigation water from a municipal or community water system. (**White City**)
Q. All projects and any interested project. (**Pierce County**)

General Exemptions

A. Single-family residences. (**Albuquerque**) (and two-family residences: **Glendale**) (**Pierce County**) (**Reno**)
B. Single family developments with less than five lots, that are not adjacent to "collector" or larger streets. (**Las Vegas**)
C. Private areas of single-family residences and private areas of multi-family residences. (**Gilbert**) (**Santa Rosa**)
D. Single-family detached dwellings on residentially zoned lots, two-family dwellings on their own lots, multi-family dwellings with 8 or fewer units on a single lot, properties in the Central Business District. (**Greensboro**)
E. Properties in the Business Capitol District. (**Santa Fe**)
F. Cemeteries. (**Leander**)
G. Registered historical sites. (**Santa Rosa**)
H. Ecological restoration projects that do not require permanent irrigation systems. (**Santa Rosa**)
I. Any landscape irrigated by reclaimed water. (**Glendale**) (**Santa Rosa**)
J. Any landscape irrigated by private well water. (**Santa Rosa**)
K. Developments that can obtain irrigation water from a municipal or community water system. (**White City**)

Turf Limit Exemptions

A. Golf courses. (if 10+ acres: **Gilbert***) (**Glendale**) (if "functional need": **Santa Rosa**)
B. Schools, parks, cemeteries. (if 10+ acres: **Gilbert***) (**Glendale**) (**Las Vegas**) (if "functional need": **Santa Rosa**)
C. Playgrounds, sports fields. (if "functional need": **Santa Rosa**)
D. Public parks and commercial recreation areas. They "shall install only the minimum cool season turf required for the active recreational use." (**Santa Fe**)
E. Public recreation facilities, common areas of housing developments. (if 10+ acres: **Gilbert***)
F. "Active recreational areas"--which measure at least 100 feet on a side and a minimum of 10,000 square feet. (**Gilbert**)

* These fall under the state regulated program for turf-related facilities

Because turf tends to require much more water than other landscape plants, many communities try to reduce its prevalence. It is therefore interesting to note provisions in Leander's and White City's ordinances. Leander <u>requires</u> detached single-family residences to have "lawn grass from the front property line to the front two (2) corners of the structure." Leander's planner could not be reached for comment. White City's ordinance states, "In areas where a municipal or community water system will provide irrigation water, mowed and irrigated lawn within the required front yard area may be substituted for a maximum of fifty percent (50%) of the required shrubs on a percentage basis (i.e., 25 percent lawn replaces 25 percent of required shrubs...)" The White City planner was surprised to hear of this, and although this was a new part of the ordinance thought it should be changed.

Maximum Landscapable Area in Turf (or any water intensive plants, if noted)

A. **0%** in public facilities, except for schools, parks, and cemeteries. (**Las Vegas**)
B. **0%** high water use turf or other high water use plants in city owned development other than parks, golf courses, and housing. (**Albuquerque**)
C. The greater of **3%** of the required open space or **1,000 sq.ft.** in commercial and industrial, if cool season turf. No limit if warm season turf. (**Santa Fe**)
D. The lesser of **10%** of total lot area or **1,000 sq.ft.** in single-family residences, if cool season turf. No limit if warm season turf. (**Santa Fe**)
E. **10%** of landscapable area of common area in single-family and multi-family. (**Gilbert**)
F. **20%** of the landscaped area in excess of 20,000 sq.ft. for hotels/motels. (**Glendale**)
G. **20%** of the landscaped area in excess of 10,000 sq.ft. for non-residential developments. (**Glendale**)
H. **20%** of required common open space in multi-family, if cool season turf. No limit if warm season turf. (**Santa Fe**)
I. **20%** (including water surfaces of water features) of model homes; water intensive landscaping can be placed only where it is functionally useful. (**Gilbert**)
J. The lesser of **20% or 3,000 sq.ft.**, but no less than 300 sq.ft., high water use turf or other high water use plants in city owned housing and all non-city owned properties, other than golf courses and single family residential. (**Albuquerque**)
K. **25%**. (**White City**)
L. **25%** of landscapable area in commercial and industrial. (**Las Vegas**)
M. **30%** of landscapable area in multi-family. (**Las Vegas**)
N. **40%** if non-drought resistant cool-season grass, **50%** if drought resistant cool-season grass or warm-season grass. (**Santa Rosa**)
O. **50%** of total front yard area in single-family developments with five or more lots adjacent to "collector" or larger streets. (**Las Vegas**)
P. **50%** of the landscaped area in commercial, industrial, model homes, and multi-family. (**Reno**)
Q. "For all developments, except hotels and motels, the water intensive landscaped area shall not exceed an area calculated by adding 10,000 square feet plus 20 percent of the facility's landscapable area in excess of 10,000 square feet…If the area of the lot is 10,000 square feet or less, the water intensive landscaping shall be limited to an area equal to 10 percent or less of the total lot area." (**Gilbert**)
R. For hotels and motels, the water intensive landscaped area is calculated by adding 20,000 square feet plus 20% of the facility's landscapable area in excess of 20,000 square feet. If the lot is 20,000 square feet or less, the limit is 10% of the total lot area. (**Gilbert**)
S. Only "the minimum cool season turf required for the active recreational use" in public parks and commercial recreation areas. No limit on warm season turf. (**Santa Fe**)
T. Golf courses, city owned parks, and city owned athletic fields: High water use turf or other high water use plants "shall be allowed only in those areas with heavy usage or foot traffic, such as athletic fields, playgrounds, and golf course tees, greens, and fairways." (**Albuquerque**)
U. Golf courses: 5 acres average per hole with a maximum of 10 additional acres for driving range. (**Las Vegas**)

Turf tends to require more water than other landscape plants and is difficult to irrigate effectively when in narrow strips.

Minimum Width of Turf

A. 5 feet. (**White City**)
B. 8 feet. (**Reno**) (**Santa Rosa**)
C. 10 feet recommended. (**Pierce County**)
D. 10 feet if cool season turf. (**Santa Fe**)

Grass Type/Species

A. "If utilized in the landscape newly seeded lawns or installed sod shall include drought-resistant and hardy varieties which, when properly installed and maintained, are capable of surviving under conditions of restricted water use." Applies to all permitted landscapes. (**Pierce County**)
B. "As of March 1, 2002, turf grass sod or turf grass seed mixes installed within the city limits shall contain 25% or less Kentucky bluegrass." Public parks and commercial recreation areas are exempt. (**Santa Fe**)
C. "Warm season grasses are recommended for most turf applications. The installation of cool season turf grasses is discouraged, as they require greater quantities of irrigation water. Refer to the City of Santa Fe Recommended Plant List for specific information on grass species. Cool season turf shall be limited to areas with relatively low evaporation from wind and heat and/or locations used for passive or active recreation." (**Santa Fe**)
D. "It is recommended that grass areas be planted with drought resistant species normally grown as permanent lawns, such as Bermuda, Zoysia, or Buffalo. Grass areas may be sodded, plugged, sprigged or seeded except that solid sod shall be used in areas subject to erosion. St. Augustinegrass and zoysiagrass are recommended for shady areas. Buffalograss, zoysiagrass or bermudagrass are recommended for sunny sections of the landscape in Leander." (**Leander**)

Plants Selected in Non-High-Water Areas

A. "…shall emphasize low water consumptive plants." **(Reno)**
B. "...shall be of a locally adapted nature. Refer to the recommended plant species list…" (**Greensboro**)
C. "...shall be well-suited to the climate, geology and topographic conditions of the site, and shall be low-water-use once established." (**Santa Rosa**)
D. "…shall emphasize drought tolerant plant species and shall limit the use of high water use plant species....For appropriate plant material see the City of Santa Fe Plant List and consult local nurseries." **(Santa Fe)**
E. "...must be low water use plants." This means "plants listed in the Phoenix Active Management Area's Third Management Plan Low Water Use Plant List." (**Gilbert**) (**Glendale**)
F. "Only drought tolerant native and non-invasive exotic species may be used…" (**White City**)

Providing lists of appropriate plants can prevent landscape architects having to guess which plants will be approved.

Plant List

A. None. (**Santa Rosa**)
B. Trees only. Within the "Irrigation" section. (**Reno**)
C. List of recommended plantings available upon request. (**Pierce County**) (**White City**—also notes plants' fire resistance)
D. In Appendix. (**Greensboro**) (**Leander**)
E. City of Santa Fe Plant List. (**Santa Fe**)
F. Albuquerque Plant List. (**Albuquerque**)
G. Phoenix Active Management Area's Third Management Plan Low Water Use Plant List. (**Gilbert**) (**Glendale**)
H. Southern Nevada Water Authority xeriscape guidelines. (**Las Vegas**)

The Intent of Plant Guidelines

A. "The intent of a plant material guideline is to encourage use of plants native to the Pacific Northwest and introduced plants common to the Pacific Northwest, in that order, to maximize use of rainwater, to reduce general maintenance needs, and to encourage the development of landscape designs reflective of our natural surroundings. It is also the intent of the plant material guideline to encourage the use of drought-tolerant plants in landscape designs to reduce the amount of water devoted to outdoor watering at a time when population pressures are increasing faster than the water supply." (**Pierce County**)
B. "The City experiences frequent droughts and periodic shortages of adequate water supply; therefore, it is the purpose of this Section to encourage the use of drought resistant vegetation that does not consume large quantities of water." (**Leander**)

Incentives for Using Waterwise Plants

A. The number of trees, shrubs, and vegetative groundcover required per the landscape levels and parking lot landscape standards may be reduced by 25 percent and spacing requirements increased by 25 percent when a development uses Pacific Northwest native or drought-tolerant landscape materials in the following proportions: 75 percent of vegetative groundcover and shrubs, and 50 percent of trees. (**Pierce County**)
B. "The size of the required plant species is dependant on whether it is drought tolerant or not drought tolerant." Waterwise canopy trees must be a minimum of two inches in caliper, non-waterwise canopy trees must be a minimum of three inches. Waterwise understory trees must be a minimum of one inch in caliper, non-waterwise understory trees must be a minimum of two inches. (**Greensboro**)

Soil tilling and amending improves texture, making water more likely to remain in the root zone instead of merely running off the surface (such as with clay soils) or quickly percolating through (such as with sandy soils).

Soil Tilling

A. Encouraged to a minimum of 12 inches deep. (**Pierce County**)
B. Required to a minimum of 4 inches deep in lawn areas. (**Leander**)
C. Required to a minimum of 6 inches deep in lawn areas, and to the depth of the root ball for shrubs and trees. (**Reno**)
D. Required to a minimum of 8 inches deep. (**Greensboro**)
E. Non-mechanically compacted soil required a minimum of 12 inches deep. (**Santa Rosa**)

Soil Amending

Depth

A. Organic amendment encouraged a minimum of 4 to 6 inches deep. (**Pierce County**)
B. Compost required a minimum of 2 inches deep. (**Leander**)
C. Organic amendment required a minimum of 6 inches deep. (**Reno**) (**Santa Rosa**)
D. Organic amendment required a minimum of 8 inches deep. (**Greensboro**)

Rate

E. Organic amendment encouraged at a rate of 3 to 4 cubic yards per 1000 square feet. (**Pierce County**)
F. A minimum of 2 inches of organic amendment required. (**Reno**)
G. Compost required to be 25% of soil. (**Leander**)
H. Organic amendment required at a minimum rate of 5 cubic yards per 1000 square feet, or per specific amendment recommendation from a soils laboratory report. (**Santa Rosa**)

Mulching with certain materials helps keep the sun's heat from penetrating the soil and reduces the evaporative loss of water from the soil.

Mulching of Exposed Soil Surfaces

A. 3 inches mulch encouraged on bare soil; 2 inches where plant materials will cover. (**Pierce County**)
B. Minimum of 2 inches required. (**Las Vegas**) (**Santa Fe**)
C. Minimum of 2 inches of porous mulch required. (**Santa Rosa**)
D. Minimum of 2 inches of vegetative mulch required. (**Leander**)
E. Minimum of 3 inches required. (**Greensboro**)
F. Minimum of 3 inches of pervious, nonliving mulch in "planter areas" required. (**White City**)
G. Minimum of 4 inches required under trees and shrubs. Minimum of 4 inches required wherever mulch is used. (**Reno**)

Dealing with Slopes

A. "With the exception of temporary irrigation systems needed to establish low water use plants, spray irrigation shall not be used on slopes greater than four feet of horizontal distance per one foot vertical change (4:1)." (**Albuquerque**)
B. "The maximum slope of lawn or turf areas shall be 3:1. Where a berm wider than ten feet is provided, one additional foot of level (7:1 or flatter) planted area is required for every three feet of bermed area to capture slope runoff at the toe of the berm." (**Reno**)
C. "Turf, sod, or grass seeding of cool season species shall not be planted on slopes greater than 25%, or in areas where any dimension is less than 10 feet." (**Santa Fe**)
D. "No turf or high-water-use plants shall be allowed on slopes exceeding 10%, or 25% where other project water saving techniques can compensate for the increased runoff, and where need for such slopes is demonstrated." (**Santa Rosa**)
E. "Any berm shall have…a side slope no greater than 3:1." **(Greensboro)**
F. "Slopes exceeding the 3:1 ratio shall be terraced." **(Las Vegas)**
G. "Turf areas that are less than ten (10) feet in width shall not be bermed." **(Las Vegas)**
H. "Planting beds shall be swaled, sloped, or recessed below grade a minimum of 2 feet to prevent fugitive water." (**Santa Fe**)

Water Harvesting

A. "The potential for using harvested water should be evaluated and, when practical, incorporated into landscape design. Such design shall be consistent with the requirements of the city's Flood Hazard Control Ordinance and the Drainage Ordinance as currently adopted or subsequently amended." (**Albuquerque**)
B. "Alternative sources of irrigation water shall be developed including harvested water from roof and site runoff. Graywater use is recommended where appropriate. Potable water shall be used as a back-up or temporary irrigation water source to the greatest extent possible. The purpose of these strategies is to develop drought tolerant landscapes, and to reduce the demand on the potable water system." (**Santa Fe**—contains more details about water harvesting and graywater use)
C. "The landscape plan shall include passive water harvesting for landscape irrigation purposes as a minimum requirement. Passive water harvesting shall be a primary component of the stormwater management requirements. The use of active water harvesting and distribution systems for landscape irrigation is encouraged." (**Santa Fe**)
D. "All irrigation water shall be retained on-site. When required, swales shall channel water to larger holding areas, catch basins, other planting areas, gravel sumps and/or dry-wells. Areas that accumulate system water shall be provided with underground drainage systems to carry water to holding or discharge areas." (**Las Vegas**)

Incentives for Irrigating with Reclaimed Water

A. Exemption from water efficient landscape policy. (**Glendale**) (**Santa Rosa**)
B. More water-intensive landscaping allowed, up to 50% of landscapable area. (**Gilbert**)
C. The town's "reclaimed water" use rate is charged. (**Gilbert**)
D. When and if irrigation is restricted to three days per week, those using treated effluent, water harvested from precipitation, and/or grey water are exempt. (**Santa Fe**)

When plants are grouped according to water needs, irrigation can be fine-tuned to the plants' requirements and water is used more efficiently.

Grouping Plants with Similar Water Needs

A. Encouraged. (**Greensboro**) (**Pierce County**) (**White City**)
B. Required. (**Santa Fe**) (**Santa Rosa**)

Separate Irrigation Circuits Required for

A. Plants with different water needs. (**Santa Fe**) (**Santa Rosa**)
B. Different solar exposures. (**Santa Rosa**)
C. Different soil types. (**Santa Rosa**)
D. Different slopes. (**Santa Rosa**)
E. Different microclimates (e.g., understory, courtyard, parking lot). (**Santa Rosa**)
F. Different irrigation methods. (**Santa Rosa**)
G. Permanent and temporary irrigation lines. (**Santa Fe**)

Direct Application Methods (e.g., drip, bubbler, or subsurface drip)

A. Drip irrigation encouraged. "Traditional spray irrigation is prohibited except for turf areas." (**Greensboro**)
B. Required in parking lot landscaping. (**Las Vegas**)
C. Required when overhead irrigation would result in overspray, runoff, or non-uniform application. (**Santa Rosa**)
D. Required in median strips, parking islands, and all irregular turfgrass or landscape area less than 10 feet in width. (**Leander**)
E. "Spray irrigation shall not be used to apply water to any area within eight feet of a street curb or storm sewer inlet. These areas may be irrigated by drip, bubbler, soaker, or sub-surface irrigation systems." (**Albuquerque**)

Spray Irrigation

A. Prohibited for watering trees and shrubs. (**Santa Fe**)
B. Prohibited except for turf areas. **(Greensboro)**
C. Prohibited in areas less than 10 feet in any dimension. **(Santa Fe) (Leander**)
D. Prohibited in areas less than 10 feet in any dimension, except within back or side yards of residential properties. **(Albuquerque)**
E. Prohibited in areas less than 15 feet in any dimension in parking lots. **(Albuquerque)**

Irrigation System Provisions

A. Irrigation shall be designed to be "site-specific, reflecting plant type, soil type, infiltration rates, slopes, and prevailing wind direction." (**Albuquerque**)
B. "Irrigation systems shall be designed for the site-specific topography, site orientation, micro-climate, prevailing winds, and soil type so as to prevent runoff, minimize evaporation, and promote infiltration." (**Santa Fe**)

C. “Sprinkler heads shall have precipitation rates matched within 20% of one another on each irrigation circuit.” (**Santa Rosa**)

D. A “permanent underground irrigation method with an automatic controller plus an overriding rain switch” is required, unless the plant materials are drought tolerant, whereupon the irrigation method needs to provide water only until the plants are established. (**Pierce County**)

E. “Irrigation system operation information including recommended monthly and seasonal irrigation schedules, and water budgets based on gallons used for landscape plantings for year one and year three, shall be included on the irrigation plan or with attached documentation.” (**Santa Fe**)

Irrigation System Audits

A. “An audit of the irrigation system by a registered landscape architect or certified irrigation auditor shall be required and a copy of that information provided to the applicant and the Department within 30 days of completed installation. The audit shall identify the evapotranspiration rate of the site and certify that the amount of water being applied through the system, per the irrigation system design, is adequate to maintain the health of the plantings, but does not overwater the vegetation.” (**Pierce County**)

B. “All new development with new spray irrigated landscaped areas totaling one-half acre or more shall have a Landscape Irrigation Audit performed by a Certified Landscape Irrigation Auditor, certified by the Irrigation Association. The auditor shall be independent of the property owner and of all contractors associated with the property. The audits will be conducted in accordance with the current edition of the Landscape Irrigation Auditor's Handbook. The minimum efficiency requirements to meet in the audit are a 60% distribution uniformity for all fixed spray systems and a 70% distribution uniformity for all rotary systems. The results of the audit shall be provided to the city in a letter or other form acceptable to the city and shall be signed by the Auditor. Compliance with this provision is required before the city will issue a Certificate of Occupancy or, in the case of park development, a Letter of Final Acceptance.” (**Albuquerque**)

C. “All new development with spray irrigated landscapes greater than ten acres shall have the sprinkler heads tested for uniformity of performance using the Center for Irrigation Technology's (CIT) Sprinkler Profile and Coverage Evaluation (SPACE) program, or a comparable assessment acceptable to the city. The sprinkler heads shall have a scheduling coefficient of 1.3 or less for full circle heads and 1.5 or less for partial circle heads, with a rating of 1.0 being perfect. The sprinkler heads shall be installed in the spacing and pressure range tested. The results of this test shall be provided to the city in a form acceptable to the city. Compliance with this provision is required before the city will issue a Certificate of Occupancy or, in the case of park development, a Letter of Final Acceptance.” (**Albuquerque**)

Alternative compliance is important for instances when "maintaining the spirit rather than the letter of the law is appropriate." However, "this process is not a departure or waiver. The proposed solution must equal or exceed existing requirements" (Martz 1990, 14).

Other water-reducing designs and innovations are considered by six communities: Greensboro, Las Vegas, Leander, Santa Fe, Santa Rosa, and Reno. The following are examples of how some ordinances state that alternate means of compliance may be permitted or required.

Alternate Means of Compliance

A. "The Design Review Board will consider and may allow the substitution of design alternatives and innovation which may equally reduce water consumption for any of these requirements." (**Santa Rosa**)
B. "The Director, or other reviewing authority, may approve variations to the standards and designs set out in this chapter if they respond more appropriately to a particular site and provide equivalent means of achieving the intent of this chapter." (**Las Vegas**)
C. "Additional landscaping may be required by the Director, or reviewing authority, in order to respond to special site features, maintain an established landscape pattern created by existing landscaping in the surrounding area, or mitigate the impact of a particular development." (**Las Vegas**)
D. "Exceptions to these provisions may be granted to require a lesser amount of landscaping, by the Commission, if the aesthetic, buffering and environmental intent of this Ordinance is met, and the reduction of the landscape area results in the preservation of natural features having comparable value to the reduced landscape requirements." **(Leander)**

If waterwise landscapes are to reduce communities' water use, they must be watered less than non-waterwise landscapes. The education of homeowners and others involved in irrigating landscapes can help ensure that the appropriate amount of water is used.

Information Packets

A. "Developers of new developments shall provide to homebuyers an information package on low water use landscaping obtained from the town's water conservation officer." (**Gilbert**)
B. "Title companies and others closing real estate transactions shall provide the entity purchasing a home, business, or property with city-provided indoor and outdoor conservation literature at the time of closing." (**Santa Fe**)
C. "City departments shall provide indoor and outdoor conservation literature to: (1) All persons applying for a building permit from the permit and development review division. (2) All customers initiating new water service from the city water division." (**Santa Fe**)
D. "Landscape contractors, maintenance companies and architects shall provide their prospective clients with city-provided low water use landscape literature and water efficient irrigation guidelines at the time of presenting a service contract to the prospective client. Landscape professionals are strongly encouraged to educate their customers regarding the operation of their timed irrigation systems." (**Santa Fe**)
E. "Retail plant nurseries shall provide their "end-use customers" with city-provided low water use landscape literature and water efficient irrigation guidelines at the time of sale

of any outdoor perennial plants. An "end-use customer" is the person or persons who will ultimately own the plant material. A landscape contractor or architect is not an end-use customer. In order to facilitate the purchasing of low water use plants, nurseries are strongly encouraged to tag or sign their low water use plants that require little to no supplemental watering once established. For the sale of all turf or grass seed or sod, the customer shall be given city-provided literature indicating the restrictions to planting water consumptive turf, per Chapter XIV." (**Santa Fe**)

Good or Interesting Ideas

A. Drainage ways shall be planted in native, drought tolerant, or riparian vegetation. (**Reno**)
B. All plants *required* in a certain area shall be chosen from the plant list. (**Leander—**70 of the 76 plants listed are waterwise.)
C. "Water intensive landscaping shall be located only where it is functionally useful, such as in play areas or close to the house for energy efficiency." (**Gilbert**—applies to model homes)
D. It is "unlawful for covenants, conditions and restrictions of a new development to require the use of water-intensive landscaping or prohibit low water use landscaping." (**Gilbert**)
E. "All developments that back or side onto a street and which have a six-foot screening wall constructed on the property line shall install within the street right-of-way contiguous with the property three (3) water conserving variety shrub and one (1) water conserving variety tree for every thirty (30) feet of such reverse street frontage. All such trees and shrubs shall be provided with an automatic drip or soaker irrigation system." (**Glendale**)
F. "Plants that require spray irrigation or a mowing frequency of more than three times per year shall not be used in street medians, except that spray irrigation may be used in street medians for up to 36 months where the primary objective is to reclaim disturbed areas with low water use plants." (**Albuquerque**)
G. "Multi-family developments that were approved before the minimum landscaping requirements of this Chapter went into effect may be required to comply with those requirements, within a reasonable time and to the extent reasonably possible." (**Las Vegas**)
H. "Planting is encouraged to take place in the spring or fall planting season following Final Development Plan approval or Building Permit approval if no final development approval is required, but in no case shall planting be postponed beyond 180 days…" (**Pierce County**)

Section VII. Planners' and Landscape Architects' Views on Enforcement and Elements of the Ordinances

Introduction

I asked twelve planners and eight landscape architects how much they thought certain elements of their communities' waterwise landscaping ordinances are enforced. (For convenient cross-referencing, these elements appear below in the same order as in Section VI "Categorization of the Eleven Ordinances' Elements.") The planners' opinions were consistent with the landscape architects' opinions in almost all cases. Where their opinions differed is noted. I also asked for their comments on turf limits and plant lists. Some also shared their views on other elements of the ordinances; this information is also below.

The interviews of the eight landscape architects covered the ordinances of Gilbert, Arizona; Glendale, Arizona; Santa Rosa, California; Reno, Nevada; Albuquerque, New Mexico, Santa Fe, New Mexico; Greensboro, North Carolina; and Pierce County, Washington. The interviews of the twelve planners covered those communities plus Las Vegas, Nevada and White City, Oregon. No interview information was available for the ordinance of Leander, Texas.

The interview methodology for the planners and landscape architects is described in Sections VIII and IX, respectively, as well as Section I.

Enforcement

I asked all of the planners if their planning departments had a different attitude toward the enforcement of waterwise landscaping ordinances versus other ordinances. Attitudes were reported to be generally the same, although three planners remarked that the waterwise provisions were ignored more than other landscaping provisions, such as buffering.

One interviewee stated that the planning department ignored the waterwise provisions for the first two years, until the person charged with enforcing them started denying new developments when they weren't in compliance. A different interviewee stated that water conservation "is not currently designated a priority by our council, so we don't spend as much time on it as when [the ordinance] first came out. We look at the plans and ask 'Is it

reasonable?' It isn't worth our time to spend a lot of time on it." Conversely, a landscape architect was shocked to learn some communities are lax in their enforcement, because in his community in New Mexico "EVERYTHING is enforced! [Name of city] is quite serious about reducing water use. They check everything carefully. They make us jump through every hoop."

Four landscape architects specifically stated that they appreciate the fact that their municipalities are enforcing the criteria, and landscapes are actually installed the way they designed them. A landscape architect in a different community wished for better enforcement: "Between design review and the installation of the landscape there is plenty of opportunity for straying from the initial plan. The on-site officials have little understanding of landscape design related issues, and therefore don't enforce the original plan or the ordinance's requirements. The enforcement during installation is 'hit and miss' and depends on who's inspecting."

About half of the communities perform field inspections to verify that the completed landscape is in conformance with the approved plans before issuing a Certificate of Occupancy. (The thoroughness of these inspections is detailed later in this section.) Some of the communities require a licensed landscape architect to submit a document verifying the landscape has been completed as specified by the approved plan. Some communities rely solely on a licensed landscape architect's seal to ensure that the proposed or installed landscape will be or is in compliance.

One landscape architect said that "small projects slip through the cracks." Conversely, another landscape architect said that sometimes the enforcement for larger projects is quite lax due to "the good ol' boy network." Casting that sentiment in a more complimentary light, quite a few landscape architects appreciated that "The city tries to work with us in unique situations" and is open to "exploring different ways of doing things" and that "The bureaucrats will listen if you make a good case for what you want."

On the whole, all the planners and landscape architects interviewed appreciated the presence of their communities' waterwise landscaping ordinances, despite the varying degrees to which they are enforced. One landscape architect explained: "It initiates an attitude of 'reducing water use' at the outset of design. Without that, there's no telling what nonsense we'd get. Even though the enforcement breaks down later in the process, it's good to have these requirements and this attitude about reducing water use."

Turf Limits

Enforcement

All the planners and landscape architects interviewed from seven of the eight communities with turf limits agreed that the percentage/square footage limits on turf are strictly enforced. One of these communities so strictly enforces turf limits that on the rare occasion when the department accidentally approves more turf than should have been allowed, the department requires the removal of excess turf already installed, according to the planner. (The ordinance states that human error shall not supersede the code.) Conversely, one landscape architect stated that their turf limits are, "Marginally enforced, at best." The planner from this community stated that they only have time to check if the turf amounts look "reasonable."

Some communities' ordinances have prohibitions against islands of turf, placing turf in high evapotranspiration areas, and/or placing turf where it does not serve a recreational or cooling function. According to the planners and landscape architects interviewed from these communities, these details are often ignored or overlooked.

More than half of the eight communities have someone inspect the completed landscapes to ensure that the amount of turf planted does not blatantly exceed the permitted amount. However, a few planners and landscape architects stated that landscape plans are not required for residential developments and/or that residential landscapes are not inspected very thoroughly after completion. Thus, many residential landscapes may "fall through the cracks."

Planners' and landscape architects' views on turf limits

As stated elsewhere, two planners cited limits on the maximum amounts of turf as one of the most effective elements of their waterwise landscaping ordinances. Another planner thought it was unfortunate that in his community single family homes were exempt from turf limits, as single family households' lawns collectively consume a great deal of water.

A landscape architect from a community that allows only a very small percentage of turf stated, "The turf limits don't bother me at all. You just need to be creative." However, a different landscape architect stated that turf limits end up costing developers more money, because he must spend extra time figuring out how to best place the turf.

Two landscape architects thought the turf limits need to be more flexible. One related that he wanted to turf a small parking lot island, because the landscaping would be ripped out in

a few years when the parking lot expanded. However, due to the maximum allowable turf area percentage formula, he had to install shrubs and trees instead. He also wanted the ordinance changed so that turf is "limited to where it's actually *used*. Saying a twenty percent or ten percent hard rule—sometimes you need less or more, it depends on the project. It should be a judgment call based on the *use* and specific project. There should be some flexibility if you make a good case. I'm not against turf, don't get me wrong, but it should serve a functional use."

The second landscape architect wanted more flexible turf limits because he has been kept from turfing water retention basins. "Turf is good for filtering out oil and debris from the street. You use gravel and your landscape is going to wash away down the hill. And you have to look at all that crap in the gravel. Grass is a tremendous medium to clean the environment."

Minimum Width of Turf

Four of the eleven studied communities have ordinances regulating a minimum width of turf and a fifth community recommends a minimum width. The four communities regulating a minimum width all enforce it, according to the planners and landscape architects interviewed. However, one of the landscape architects stated that he has seen a few new developments with turf strips that are narrower than permitted, which he assumes must have been overlooked. This correlates with the planner from that community stating that they now allow some planned unit developments or special planning units to have turf strips more narrow than the ordinance allows, due to the existence of better irrigation heads now than when the ordinance was written. (He stated that new irrigation heads can spray five foot strips without overspray.)

Grass Type/Species

Leander's ordinance has detailed recommendations of grass species, while Pierce County and Santa Fe require certain species or types of grass in new seeded or turfed installations. The Pierce County and Santa Fe planners stated that they do not enforce this. One of the planners opined it was futile to try to enforce it: "We have no control over where the sod comes from. You can't sell it here, but you can buy it somewhere else and then install it. You're not supposed to, but I'm sure it gets installed all the time…unless you get down there with a hand lens and are trained in grasses, you can't tell the difference between fescue and bluegrass." The landscape

architect from this community stated that he was not sure how many landscape architects install the appropriate grass species, but wryly noted that once the rains stop in the summer it's easy to tell which areas are cool season grass versus warm season grass. The other community's landscape architect stated, "We already use a lawn mix that's appropriate to the area"—but was hesitant to comment on its drought-tolerant nature.

Plant Lists and Plant Specifications

Enforcement

All eleven communities' ordinances specify the type of plants encouraged or permitted in required landscaping, whether in general terms (e.g., "must be low-water use plants") or by referring to lists of recommended or required plants. I asked eight planners and five landscape architects from seven of these communities how strictly they thought the waterwise aspects of the plant guidelines were enforced.

Two of the seven communities only occasionally check the landscaping plans to ensure that the specified vegetation is drought tolerant, and five communities always check the plans. Within these five communities there is variation in enforcement. The planner from one community stated they always check the plan *and* the site to make sure all required vegetation is waterwise. The landscape architect from that community stated landscapes are checked on a random basis and it appears the more visible and bigger jobs receive more scrutiny. However, "For the amount of staff they have, they do a pretty good job." Another community's planners also indicated that they always check both the plan *and* the site to ensure the vegetation is drought tolerant. However, then he commented that most of the inspectors "don't know an oak tree from some other kind of tree." The other planner stated that developers always choose waterwise plants anyway, and even if they did not, it is "really the developers' problem if they don't want to use drought tolerant plants, because they're the ones who are going to have to pay to replace them if they don't do very well. And they have to pay the water bill."

The communities also vary in how strictly they expect landscape architects to adhere to their plant lists.

A planner from one community stated they use the plant list to determine if plants are waterwise; however they allow "a little bit of wiggle room…so that someone with a *real* plant background can review the landscape plan and make decisions and isn't in a bureaucratic straight

jacket. It allows for value judgments and taking mitigating circumstances into account, and maybe a little bit of horse trading in the landscape plan's requirements." In contrast, the landscape architect from this community stated his understanding is that one *must* use only plants from the list, which he found extremely limiting.

Three planners from different communities related that although the plant lists are only "recommended," landscape architects are nonetheless expected to draw from the list. The landscape architects from these communities stated that the department has also allowed them to use plants that aren't on the list when they can be deemed waterwise or "appropriate" for the site.

A different planner stated that his community's plant list is considered merely suggestions. His department determines the acceptability of plantings not by their species, but by how they are irrigated. They focus on the irrigation system detailed in the plans and how it is installed on site, and are much more lenient if plants are watered with drip irrigation. The landscape architect stated that the department only checks for waterwise plants on the plans or the site about fifty percent of the time, and often the site inspection occurs before the plants are installed. However, "this is a harsh climate, and most of the plant materials that do well here are already drought tolerant." He lamented the fact that nonetheless many people overwater them, "but nothing is done about that."

Planners' and landscape architects' views on plant lists

Opinions on the plant lists varied considerably. A few landscape architects and planners stated that developers wanted lush landscapes and do not like to be constrained by the plant list (nor turf limits), whereas other landscape architects and planners stated that developers always want to use waterwise plants anyway because that is the most cost-effective.

Two landscape architects and a planner stated their waterwise plant lists contain a wide variety of plants and it is not difficult to make landscapes look lush and attractive, whereas one landscape architect stated that "The hardest part is it's difficult doing plant design when you have this extremely limited plant palette." Three landscape architects appreciated not having to guess what plants are acceptable. "With the plant list I don't need to spend my time researching a whole bunch of plants for the landscape. I can use the plant list and know these plants are tried and true for this region." They urged communities that are considering waterwise landscaping ordinances to include plant lists.

A planner stated that nurseries are concerned that they will lose money because waterwise plant lists will decrease the demand for non-waterwise plants. Two landscape architects from different states related that the most difficult aspect of their landscaping ordinances is that there is not an adequate supply of some of the plants on the waterwise plant lists. It takes nurseries three to five years to catch up with the demand for shrubs, and seven to ten years for trees, and "Just because some city group decides to emphasize waterwise plants, it doesn't mean the supply is there!" Conversely, a landscape architect also related that the "nurseries are always carrying new types of plants and strains; some are better than the old varieties….But the [plant] lists aren't updated enough" to include them.

Two landscape architects thought there should be different plant lists for different parts of town. The current "green" areas should be allowed to have more high water use plants, whereas the more desert-like areas "should be kept in a desert theme" and "The color palette should be in keeping with the natural outdoors." One landscape architect noted that this is why Scottsdale, Arizona has three different plant lists.

Incentives for Using Waterwise Plants

Two planners and two landscape architects were interviewed from the two communities that offer incentives for using vegetation that is waterwise. According to them, the incentive that waterwise trees are permitted to be smaller is "used all the time" because it saves developers money. The incentive that less plants are required if they are waterwise has "almost never" been used because landscape architects don't want their landscapes to look sparse.

Soil Tilling

Four communities *require* tilling the soil a minimum of four to twelve inches deep, and one community *encourages* tilling a minimum of twelve inches. The landscape architect from this latter community had no idea this was encouraged—"HOW deep?" he asked incredulously. He stated this was seldom done, though he thought it was a good idea. Of the four communities requiring tilling, two planners commented on enforcement. One stated he checks the plans to make sure they specify tilling to that depth, however it is not checked at the site. The other planner stated that enforcing the soil tilling requirements was extremely difficult. Of the four communities requiring tilling, three landscape architects commented on enforcement. One stated

that it was definitely enforced, while the other two doubted some of the contractors tilled to the required depth: "It seems like they might check it in the plans, but it's rarely checked in the field. Most landscape architects specify [number of] inches *or more* for tilling, but maybe only half of the contractors actually do it," and "The cheaper contractors probably aren't doing this. The better contractors till much deeper than this, because [number of] inches is the *minimum*…it should be deeper."

Soil Amending

Four communities *require* amending the soil with organic matter, and one community *encourages* it. The landscape architect from the community that encourages it ("at a rate of 3 to 4 cubic yards per 1000 square feet" and "4 to 6 inches deep") stated he has never heard a single word about it. The comments from the planners and landscape architects imply that soil amending is checked on the plans in some communities, it is never checked in the field, and that some contractors probably do not amend the soil, while the better contractors are more likely to.

Mulching of Exposed Soil Surfaces

Seven communities *require* a minimum of two to four inches of mulch, and one community *encourages* three inches. Information from the planners and landscape architects from five of the communities that require mulch indicate mulching is strongly enforced in four of those communities and is actually checked in the plans as well as on site, however is enforced only on a "complaint basis" in the fifth.

Some planners thought mulching is extremely important in conserving water. One planner stated, "We used to encourage [number of] inches or more, now we encourage five or six. We strike the [number of inches required by the ordinance] out, and write in five inches as a condition of approval. It's not just a requirement to keep the weeds out; it actually is beneficial for [reducing] evapotranspiration if there is more mulch down than just [the ordinance-required number of] inches." A planner from a different community stated that he believes mulch "is the most effective part" of the ordinance, as with the required minimum number of inches "you don't lose water to evaporation. I check in the field to make sure it really is [number of] inches, and not less. Mulch makes a huge difference in conserving water."

Dealing with Slopes

Six communities have ordinances meant to ensure efficient water use on slopes. According to information from the six planners and four landscape architects interviewed from these communities, this is enforced in all the communities except one. The landscape architect from this non-enforcing community stated that landscape architects commonly turf slopes steeper than the permitted grade, because that amount "really isn't much at all—they naturally exist in many landscapes." Some of the departments check for non-compliant slopes only on site, while the others check both on the plans and on site.

One planner thought that prohibiting turf and other high-water-use plants on steep slopes is "one of the best things" about his community's waterwise landscaping ordinance, because that used to be quite common.

Incentives for Irrigating with Reclaimed Water

Four communities offer incentives for irrigating with reclaimed water. Three communities' planners and two landscape architects gave the impression that the incentives are effective and are frequently used "when the area is large and effluent water is available."

As stated elsewhere, when the eight landscape architects from all the communities were asked what changes should be made to the waterwise landscaping ordinances, three thought re-using water should be emphasized more. Whereas one landscape architect thought that any project using effluent water for irrigation should have absolutely no restrictions on plantings, another landscape architect thought that waterwise plants should still be required, otherwise the community is "reverting backwards."

Grouping Plants with Similar Water Needs

Three communities encourage plants with similar water needs to be grouped together for better irrigation efficiency, and two communities require it. The planner and landscape architect from one of these two communities stated that "no irrigation plans are required for single family residential," so this is only enforced on commercial and multifamily developments. The landscape architect stated, "We always do this anyways….The majority of residents probably don't even know about this part of the ordinance. But you no longer see high water use plants next to low water use plants in landscapes that are prepared by a landscape designer." However,

a different landscape architect stated, “It’s difficult to group the plants together according to their water needs. It takes a lot of time to do this.”

Irrigation System Audits

At least four communities have detailed minimum standards that irrigation systems must meet, however these tend to not be enforced. Two of these communities also require efficiency audits of the irrigation system, proof of which must be submitted to the planning departments. The planners from these two communities stated that audits have never occurred. One planner stated that he thinks the audit is a “good idea,” but there is no “tickler” in the process to ensure it happens. The other community’s planner stated that in practice there only needs to be proof that the irrigation system “works.”

A planner from a community that does not regulate irrigation efficiency stated that there should be irrigation requirements or water budgets to ensure plants are not overwatered. A planner from another community that does not regulate irrigation system efficiency said that nonetheless he checks both the irrigation plan and the installed system for efficiency: “Requiring irrigation to be efficient is important. I check for low-trajectory heads, and prefer drip to bubblers.” As detailed elsewhere, a landscape architect thought that irrigation technology was one of the most important elements to emphasize in a waterwise landscaping ordinance.

Information Packets

Two communities’ ordinances require title companies, city departments, landscape architects, landscape contractors, retail plant nurseries, and/or developers to distribute city-provided information about low water use landscaping. One planner thought that this is one of the most effective parts of the ordinance. She stated that developers are pleased to distribute the literature to new residents because it explains the waterwise landscaping in a beneficial light (which adds value to the homes). The planner from the other community stated that city departments and nurseries distribute the required literature; however, he is unsure if the others do. The landscape architect from this community did not know if other landscape architecture firms practice this, but stated that his firm would be agreeable to it.

Section VIII. Planners' Views on the Ordinances in General

Introduction and Methods

I interviewed eleven planners and one water conservation officer from ten of the eleven communities. (Two of the planners also happened to be certified landscape architects. Henceforth all twelve will be referred to as simply "planners.") Despite my numerous contact attempts, the planner in Leander, Texas never replied. Therefore, planners' opinions for all the communities except Leander are represented by the information gathered below. (The ten communities covered by the information below are Gilbert, Arizona; Glendale, Arizona; Santa Rosa, California; Las Vegas, Nevada; Reno, Nevada; Albuquerque, New Mexico, Santa Fe, New Mexico; Greensboro, North Carolina; White City, Oregon; and Pierce County, Washington.) Although two people were interviewed from two of the communities, the questions I asked them had little overlap, so there should be little concern of over-representation of those communities.

Each interview was conducted by telephone and lasted 16 to 35 minutes. To encourage freedom of expression I told the planners I would keep their names confidential and omit identifying details from their statements. All the planners interviewed seemed willing to share their honest views on the subject; some doing so in great detail.

My first question ascertained I had the most recent version of the ordinance. My last question asked for the names of a few landscape architects in the community, whom I would interview later. The answers to questions about specific details of the ordinance (such as plant lists and turf limits) as well as enforcement are combined with the landscape architects' answers and are located in Section VII "Planners' and Landscape Architects' Views on Enforcement and Elements of the Ordinances." I asked these questions about the elements of the ordinances first, to serve as a refresher on the waterwise landscaping aspects of the ordinance.

The other questions were:

1. Do you know why exactly the waterwise landscaping features of this ordinance were adopted?
2. How do the waterwise landscaping features of this ordinance impact the workload of the planning department?
3. What comments and complaints do you hear from landscape architects, developers, and the community?

4. What is the greatest difficulty in implementing this ordinance?
5. What parts of this ordinance are particularly effective?
6. What parts of this ordinance could be improved?
7. Based upon your experience, what recommendations do you have for planning departments that are considering waterwise landscaping ordinances?

1. Why the Waterwise Landscaping Features of the Ordinance were Adopted

Most ordinances were adopted to reduce water use, but the specific reasons planners gave for this goal varied: three planners cited state requirements, three other planners cited recent droughts, two planners from an arid state referred to a tradition of conserving water, one planner said the community wanted to reduce the need for new water facilities, and one planner said the local utilities wanted water to be conserved. Four of the planners also mentioned their communities' growth as a factor.

Details on the specific reasons communities adopted waterwise landscaping ordinances:

- The planner from one community stated that although growth is increasing faster than the ability to withdraw water, the only reason the landscaping ordinance includes waterwise features is because the local water utilities pushed the issue.
- "Water conservation has just always been done." A similar answer was given by the other planner from the same arid state.
- Two fast-growing cities were required by the state to reduce the number of gallons used per person per day, or stop growing.
- One city was required by the state to adopt water efficient landscape regulations.
- Another city sought to reduce overall per capita water use by 30 percent to reduce the need for new capital facilities otherwise required to meet the system's demand.
- Two planning departments were spurred into action by "severe drought" and "water shortage and rapid growth."
- Another city had been suffering from a few years of drought and specifically wanted to ensure that any grass planted would actually be used, as opposed to being the default vegetation.

2. How Waterwise Landscaping Elements Impact Planning Departments' Workload

Eight of the ten planners asked this question reported that the water-conserving features of the landscaping ordinances only minimally impacted workload, and "there are just more things to check."

One jurisdiction originally required applicants to submit a lot of forms which created "quite a bit of work" for the planners, however now that they have stopped requiring the forms, "it's almost no work." A different planner stated that the waterwise requirements and incentives made the code more complex, "so it takes longer to learn the code, but it doesn't take any longer to enforce." However, one planner from a community which very strongly enforces the ordinance sighed and then stated, "It's a lot of work to look at every plant on the plan and every plant in the field."

3. Comments/Complaints of Landscape Architects, Developers, and the Community

Eight of eleven interviewees stated that they had heard no comments or complaints from landscape architects, developers, nor the community. Some stated that it is likely because water shortage is widely recognized as a problem. Additionally, half the planners stated that waterwise plants and techniques were already being used by the better landscape architects before the adoption of the ordinance, and that many landscape architects were supportive of the ordinance.

The other comments and complaints were fairly diverse:

- People from one community complained about the paperwork involved with the new ordinance, forcing the planning department to be more lenient about the completion of the forms.
- The nurseries in one community were concerned that since the new plant list's emphasis was on waterwise plants, they would be stuck with unsellable non-waterwise plant stock. The nurseries were also concerned that since the incentive for planting waterwise trees is that they may be smaller than non-waterwise trees, they would be stuck with trees of sizes nobody would buy.
- Two interviewees related that although the landscape architects appear to prefer using waterwise plants, the developers and the townspeople don't want to use waterwise plants and often try to exceed the turf limits.
- However, one planner reported that in his community it is currently "the 'in thing' to beautify the area with drought tolerant plants. It's part of any code [around here]. The developers have been really good about it. There haven't been any problems."

4. The Greatest Difficulties in Implementing the Ordinance

Half of the interviewees said there were not any difficulties in implementing the ordinance. The other responses varied:

- Two planners said that follow up is the most difficult, and there is no way of knowing if the landscape is changed after it's been approved.

- "Trying to outthink the developers and builders." They are always looking for loopholes, and it "is very good the ordinance has a definitions section."
- Enforcing the soil amending requirements and soil tilling depth.
- One interviewee named two difficulties: "Making the one percent of the people who aren't aware of the requirements aware" and "Making people aware that landscaping can look *really* nice even if it's waterwise, and that there are some *really nice* looking low water use turf species."

5. The Most Effective Elements of the Ordinance

Only six of the twelve interviewees had comments about parts of the ordinance they thought were particularly effective at conserving water. Four of the six thought water re-use (e.g., graywater, reclaimed landscape water, etc.) was particularly effective, and two of these same planners also cited limits on turf. Other ideas included requiring mulch, not allowing turf on steep slopes, allowing required trees to be smaller if they are waterwise, requiring efficient irrigation, providing waterwise landscaping information, and defining key words.

Details on the specific parts deemed particularly effective:

- Water re-use.
  - City parks are encouraged to use graywater for irrigation.
  - Developers that use reclaimed water can use more lush vegetation. (Planners from three communities cited this as an effective, much-used incentive).
- Limits on the maximum amounts of turf. (Planners from two communities cited this.)
- "Mulch is the most effective part. With [the required inches] of mulch you don't lose water to evaporation. I check it in the field to make sure it really is [the required inches], and not less."
- Not allowing turf or other high-water-use plants on steep slopes is "one of the best things" for conserving water. It's a "no-brainer," but it used to be quite common in the community.
- The incentive that required trees may be one inch less in caliper if they are drought tolerant "is used *a lot.*" Smaller trees are less expensive and more likely to survive.
- Requiring irrigation to be efficient is important, especially encouraging low-trajectory heads and drip instead of bubblers.
- Providing free waterwise landscaping information packets to developers to give to residents of new developments. Developers are not willing to pay for the packets, but are pleased to distribute them because they explain the waterwise landscaping in a beneficial light.
- Including definitions of important words. Defining words prevents people from arguing about meanings.

6. Parts of the Ordinance that Could be Improved

Only three of the twelve people interviewed had ideas for improving their communities' ordinances; the other nine people thought the ordinances were fine as written (or as their departments have chosen to enforce them).

The three planners' ideas for improvement:

- "The ordinance is basically good as it is now…except that the turf limits don't apply to single family homes. Single family residential use of water on their front lawns is a *huge* use of water."
- "The ordinance focuses on the *plants*, but it should focus on the *water*. The list of plant materials is supposedly drought tolerant, but the water isn't regulated and people can dump as much water on them as they want. The *water* that the project uses needs to be regulated, *not* the *plants*. There needs to be a water budget or irrigation requirements, or something."
- Follow up signatures shouldn't be required if the initial plans were agreed on. (Her department has stopped enforcing this requirement.)

7. Recommendations on Drafting Waterwise Landscaping Ordinances

Nine interviewees offered their recommendations for planning departments considering adopting waterwise landscaping ordinances. Although the interview question was open-ended, their recommendations can be grouped in three basic categories: who should be involved in drafting the ordinance, what information is helpful, and specific elements to include in the ordinance.

Four people had recommendations about community involvement in drafting the ordinance—three people cited different groups it was important to include, while the fourth person recommended excluding the builders/developers.

Three planners thought it was important to educate those potentially impacted by the ordinance on the financial and aesthetic benefits of waterwise landscaping, and that waterwise ordinances are now mainstream.

The various recommendations of specific elements to include in the ordinance were diverse. One planner stated the best thing for other communities to do would be to simply follow his community's ordinance as closely as possible.

Details on the recommendations for planning departments considering adopting waterwise landscaping ordinances:

- Consider who should be involved in drafting the ordinance.
    - One planner stated it was very important "to work with the nurserymen on plant selection."
    - Another planner related that he had looked at the ordinances of the largest cities within a 200 mile radius to see what they were doing to conserve water in landscapes, and purposely wrote his community's ordinance so it was less restrictive than a nearby city's. Despite this, the Master Builder's Association successfully pressured the politicians to cut most of the waterwise requirements. He stated the M.B.A. was simply "afraid of change," and therefore strongly recommended involving the water purveyor and the building community at the beginning, so issues can be discussed early in the process.
    - The opposite opinion was also voiced: "The *last* thing I'd do is talk the proposed ordinance over with the developers! Write up the ordinance first, run it past legal, then have it go to council."
    - A fourth person thought his community's ordinance was particularly "well thought through and well put together" because of "a lot of input from lots of different sectors of the market." He recommended getting "as broad a base of people reviewing and writing the ordinance as possible. We had nurserymen, landscape architects, engineers, irrigation contractors, an arborist, county extension agent, city staff, landscapers and maintenance people, the water department, and more involved. We had a *very* broad base—from design to build, to sell and maintain. We tried to cover every aspect of it. That made it very tedious in the writing, but we had immediate buy-in across the board, as there was no one agenda."

- Consider what information would be helpful.
    - One planner stated it was helpful she had compared the proposed ordinance to what other cities nearby were doing, so she was able to tell the city council that the ordinance was mainstream, not extreme.
    - Another planner stated that businesses were initially opposing the soil, mulch, and other requirements, thinking they would be very expensive. It was helpful he had actual examples from other communities of the cost per lot for such requirements, including the cost of materials and the labor involved.
    - The same planner also suggested emphasizing the financial benefits to community members, in that their water bills will likely decrease.
    - One planner was concerned that waterwise landscaping has a negative image. He recommended that native plants and waterwise plants "should be used as an 'identity thing,' a positive image for the city."

- Consider what to include in the ordinance.
    - Encourage native and waterwise plants on roadways, as it saves the city water and "looks really good."
    - Use a water budget or irrigation requirements to regulate the water used on the landscape. People can easily overwater drought tolerant plants. The emphasis should be on the water, not on the plants.
    - Give people options and provide incentives: "If you *don't* have the water supply, you must meet these requirements. If you *do* have the water, then we should provide incentives to encourage you to do it."
    - Encourage water reclamation.
    - Have a Design Review Board.
    - "Have a whole section with landscaping guidelines, for example, working with the topography of the land for the design. Guidelines will help the clueless people. Also, it's helpful to keep it 'guidelines' and not 'requirements,' because you should leave it open for the creative, good ideas of landscape architects."
    - "Set up the standards for residential landscapes, but don't try to review the plans. We set our lot size too low—I don't give a rip about where the petunias go. We just need to know that they don't go out of bounds on the turf." The same planner recommended writing the maximum allowable area of turf, water features, etc. "right there on the grading plan and site plan, so Ma and Pa Kettle can see it right there…. It's hard to miss it when it says it right there, next to where the plans are being traced."
    - Always have the landscape plans be done by a *licensed* landscape architect. "This is critical," one planner said.

Section IX. Landscape Architects' Views on the Ordinances in General

Introduction and Methods

I interviewed eight landscape architects from eight of the eleven communities. I did not interview a White City, Oregon landscape architect, as the White City planner believed no development proposals had yet been submitted under the new ordinance. I decided not to interview a Leander, Texas landscape architect, as despite numerous attempts I could not obtain an interview from a Leander planner. The Las Vegas landscape architect also never replied despite my numerous phone calls and emails. Therefore, this section consists of information gathered from the landscape architects of the following communities: Gilbert, Arizona; Glendale, Arizona; Santa Rosa, California; Reno, Nevada; Albuquerque, New Mexico, Santa Fe, New Mexico; Greensboro, North Carolina; and Pierce County, Washington.

Each interview was conducted by telephone and lasted 11 to 46 minutes. To encourage freedom of expression I told the landscape architects that they would decide at the end of the interview if they did not want their names and/or their companies' names listed in the report; but regardless I would omit identifying details from their statements. Seven of the eight landscape architects seemed willing to share their honest views on the subject; some doing so in great detail. The Pierce County landscape architect, the sole interviewee that wished to remain anonymous, said very little, which may have been his nature.

The answers to questions about specific details of the ordinances (such as plant lists and turf limits) as well as enforcement are combined with the planners' answers and are located in Section VII "Planners' and Landscape Architects' Views on Enforcement and Elements of the Ordinances." I asked these questions about the elements of the ordinances first, to serve as a refresher on the waterwise landscaping aspects of the ordinance.

The other questions were:

1. What are the most difficult aspects (if any) in meeting this ordinance's requirements?
2. What change(s) would you like to see made to the ordinance?
3. From your experience, is there anything especially good or helpful about this specific ordinance or the way it is enforced?

4. In what ways (if any) does the ordinance make your job easier? In what ways (if any) does the ordinance make your job more difficult?
5. Do the requirements of the ordinance make clients perceive the landscapes as more or less aesthetically pleasing?
6. What opinions have your clients shared with you about waterwise landscaping in general, or this ordinance specifically?
7. Do you have any recommendations for communities that are considering ordinances to reduce water use in landscaping?

1. The Most Difficult Aspects in Meeting the Ordinance's Requirements

Of the eight landscape architects interviewed, only the Pierce County landscape architect stated that he had no difficulty in meeting the ordinance's requirements. (However, he hadn't realized that there were irrigation audit requirements that the planning department was not enforcing.) Three landscape architects cited problems with the plant list, and one of the same architects plus an additional one cited problems with plant availability. Two landscape architects said they worked in a few different communities, and it was difficult remembering what rules applied where. The other responses were quite diverse.

Details on the most difficult aspects in meeting this ordinance's requirements:

- The low water use plant list is in conflict with the plants prohibited on the allergen plant list. (He noted this problem is currently being addressed by this community.)
- "The hardest part is it's difficult doing plant design when you have this extremely limited plant palette." (His belief is that only plants from the plant list may be used, whereas the planner from this community stated that there is "wiggle room" for "value judgments" and "a little bit of horse trading in the landscape plan's requirements.")
- A different landscape architect initially stated he had no difficulties whatsoever with the ordinance "as it's not terribly restrictive. It's still easy to design within these design requirements." But then he added, "The most difficult aspect is that there are lots of shaded areas, and often the plants that do best in these shady areas are relatively thirsty."
- "The plants on the plant list are not always available, but then again, there <u>are</u> lots of plants on the list." (This community's plant list contained 144 drought tolerant trees and 194 drought tolerant shrubs.) He would also like to use native plants, but is frustrated by the limited supply. A landscape architect from a different state also commented that the supply of certain plants can not keep up with demand.
- Two landscape architects said that it's difficult to keep track of the different ordinances for all the communities they work in.

- One landscape architect's sole complaint, which he felt very strongly about, was that the planners do not always lay out new lots in such a way as to allow for good landscape design with "functional turf" areas. "They may have really skinny lots, or some other configuration that makes it difficult" to have turf that isn't prohibited.
- "It's difficult to group the plants together according to their water needs. It takes a lot of time to do this."

2. How the Ordinance Could be Improved

Four of the eight landscape architects said they did not think the ordinance needed changing in any way; however, two thought that enforcement of the ordinance should be increased. Of the remaining four landscape architects, one simply said landscape architects will never use the so-called incentive for using drought tolerant plants, while the other three had numerous suggestions for change: keep green areas of town green and emphasize drought tolerant plants where the town is already more desert-like, increase the flexibility of the turf rules, encourage water re-use, regulate outdoor water features, have an approved plant list, and standardize the method for determining a plant's water use.

Details on the recommended changes for the ordinances:

- Two landscape architects simply wanted to see the existing ordinances fully enforced. One stated that residential designs should be reviewed for water efficiency, and that it "doesn't do any good to have these things on the books if they're not enforced for residential." The second landscape architect stated, "Between design review and the installation of the landscape there is plenty of opportunity for straying from the initial plan. The on-site officials have little understanding of landscape design related issues, and therefore don't enforce the original plan or the ordinance's requirements. The enforcement during installation is 'hit and miss' and depends on who's inspecting."
- Two interviewees from the same southwestern state thought the ordinances should have different rules for the "green" parts of town versus the more desert-like areas. They thought that the current "green" areas should be allowed to have more high water use plants, whereas the more desert-like areas "should be kept in a desert theme" and "the color palette should be in keeping with the natural outdoors."
- Two people wanted the ordinance to be more flexible in dealing with turf. One wanted the ordinance changed so that turf is "limited to where it's actually *used*. Saying a 20% or 10% hard rule—sometimes you need less or more, it depends on the project. It should be a judgment call based on the *use* and specific project." He related that he wanted to turf a small parking lot island, because the landscaping would be ripped out in a few years when the parking lot expanded. However, due to the maximum allowable turf area percentage formula, he had to install shrubs and trees instead. The second landscape architect said that it is ridiculous he has been

kept from turfing water retention basins, and has to rely on gravel instead, which is less effective.

- Three landscape architects thought re-using water should be emphasized more. One suggested that any project using effluent water for irrigation should have no restrictions on plantings, whatsoever. The second landscape architect said there was nothing to encourage the use of effluent water in his community, except perhaps economics, and that the ordinance should encourage it. The third landscape architect simply stated "More requirements for water capturing, reuse of water, and grey water use would be welcome."
- Change the incentive for drought tolerant plants. Currently, one community's incentive is that less plants are required if they are drought tolerant. However, landscape architects want their projects to look full with plants, not sparse, and thus are not using this incentive.
- Regulate outside water features, such as fountains and waterfalls.
- Standardize the method of estimating plant water use.
- Provide an approved plant list, so landscape architects don't have to guess what is acceptable.

3. The Most Effective Elements of the Ordinance or its Enforcement

All eight landscape architects had thoughts on what was especially good or helpful about their communities' ordinances or how they are enforced. Four said they found the ordinances helpful in raising awareness, three appreciated that the ordinances set standards that developers were obliged to follow, and three liked how the planning departments worked with them in finding solutions and/or was consistent in enforcement.

Details on the best aspects of the landscaping ordinance or the way it is enforced:

- The ordinance increases the communities', developers', and landscape architects' awareness of water use.
    - "It's good in that it makes people aware of water and how much they are using….using water wisely in the landscape turns it into an amenity instead of a social or moral problem."
    - "The biggest thing is that you need to educate people. The ordinance helps make people use drought tolerant plant materials, otherwise a lot of people wouldn't. It changes the status quo, and makes it seem normal."
    - "It makes [landscape architects] pay more attention."
    - "It makes people more aware of the plants that can handle different situations better, such as native plants. It makes people more aware of water use."

- The ordinance sets standards developers are obliged to follow.
    - "It's good that it gives standards. If developers didn't have standards they had to follow, they would tend to do whatever is cheapest, which often doesn't look good, which makes the project looks bad, which makes [the landscape architect] look bad."
    - "It raises public awareness, which is good. Developers aren't usually from this region. It's nice to have these parameters to work in, and to educate them with."
    - "It initiates an attitude of 'reducing water use' at the outset of design. Without that, there's no telling what nonsense we'd get. Even though the enforcement breaks down later in the process, it's good to have these requirements and this attitude about reducing water use."

- The planning departments are consistent in their enforcement and/or work with landscape architects to find solutions.
    - "[The planning department's landscape architect] has been there forever. She's very consistent. She has good people working around her. With other cities you don't know" how much the ordinance will be enforced each time.
    - "The city tries to work with us in unique situations" and does "a pretty good job" of "exploring different ways of doing things and trying new stuff."
    - "When we make a good case for a certain plant, the city is receptive. The bureaucrats will listen if you make a good case for what you want."

4. How the Ordinance Impacts Landscape Architects' Workload

One landscape architect of the eight interviewed stated that nothing about the ordinance made his job easier, and two landscape architects stated there was nothing about the ordinance that made their jobs more difficult. Three landscape architects stated the plant list made their jobs easier and four appreciated that the ordinances helped ensure that the landscapes they design (and that are installed) are efficient and attractive. Two of the three people who stated that the plant list made their jobs easier also stated that the plant list also made their jobs more difficult. Three interviewees stated that the ordinances' restrictions in general, remembering all the restrictions, or the rare over-enforcement of the ordinances made their jobs more difficult. One person stated that devising appropriate turf layouts and calculating allowable turf percentages made his job more difficult.

Details on ways the ordinances make landscape architects' jobs easier:

- "With the plant list I don't need to spend my time researching a whole bunch of plants for the landscape. I can use the plant list and know these plants are tried and true for this region." (This sentiment was echoed by two other landscape architects.)

- "The fact that the municipalities are actually *enforcing* the criteria. Otherwise the landscape architects design it, but the developers install whatever they want, as nobody inspects it. Adhering to the strict guidelines, and making sure that the landscape actually matches the plans, is GREAT! Otherwise it cheapens the work I do, and there's no reward. It's beneficial that they inspect it as per the plan, and it's installed the way I designed it, and there's a reward for me in how it looks." (Two other landscape architects had similar comments.)
- "The ordinance is a justification for dealing with some clients, as you're prohibited from doing stupid water-wasting things. It's nice to blame your inability to do the water-wasting thing on someone else [the ordinance]. With some clients it's very important to be able to shift the blame to the ordinance."

Details on ways the ordinances make landscape architects' jobs more difficult:

- "The developers want lush landscapes and high water use lawns, and it makes them upset to be constrained [by the plant list]."
- "It's limiting in design, as there's only certain plants you can use. Also, the nurseries are always carrying new types of plants and strains; some are better than the old varieties. But the lists aren't updated enough. They need to be updated every few years. Some new plants are drought tolerant, but they're not on the list, even though they're better than what's on the list. They need to review the list and ask landscape architects' opinions. This would help save water and help make our jobs easier."
- There are more restrictions and one has to learn what is required.
- The landscaping requirements are poorly organized and are "scattered amongst different sections. It's hard to keep track of all the requirements."
- The ordinance tends to be "one size fits all" and when "administered by someone with no experience with microclimates, it may be over-enforced. But that's rare. Usually it's great."
- "It makes it much more difficult that I have to figure out how to" place turf in such a way as to not be prohibited, and the "calculations I have to do on the turf takes extra hours, and the developers have to end up paying me for that."

5. What Clients Think about the Aesthetics of Waterwise Landscapes

Of the eight landscape architects interviewed, three thought that clients were pleased with waterwise landscapes' aesthetics, two explained that clients' attitudes vary, one thought most people do not like the aesthetics, and two opined that developers only care about the cost of landscaping, not the aesthetics.

Details on how landscape architects perceive their clients' opinions on the aesthetics of waterwise landscapes:

- Clients are pleased with the aesthetics of waterwise landscapes.
    - "People are embracing a new aesthetic now, a local image" and are choosing to use "local plants more suited to our climate" instead of "the blue grass that you might find in some commercial development from Massachusetts…The aesthetic quality of the landscapes going in is quite high."
    - There are "plenty of plants" on the "drought-tolerant list that are very lush…the palette is very large. It's got some incredibly neat plants from Africa, Texas, Australia" and it isn't difficult to please clients with attractive waterwise landscapes. (Another landscape architect had a similar opinion.)

- Some clients are pleased with the aesthetics, and some clients are not pleased.
    - "Clients are as diverse as can be. Some hate it, because they're from greener places, like the east coast. Most understand. Most want to be eco-conscious. Most don't complain. The xeriscaping can look just as pleasing as other landscapes—most people like the desert look. But some people come and want it to look like their other home in Boston…. Naturalistic can be just as pretty, or prettier than other landscapes. But taste varies, and it depends on how educated they are about the desert. Sometimes it's natives who hate the desert look more than outsiders. Some outsiders really like the regional image."
    - "There's been an aesthetic shift as to what is appropriate. It's catching on more in private, larger residential developments than in commercial." Although about one-third of the houses in his traditional, older neighborhood now have waterwise landscapes, he thinks the homeowners' main motivation was to reduce their water bill, not improve aesthetics.

- Clients are not pleased with the aesthetics of waterwise landscapes.
    - "They think it's less aesthetically pleasing. I run into this all the time. It takes a while to get used to the [region's] landscape. And it takes three years before the landscape grows and is really looking great. It's really frustrating."

- Developers simply do not care about landscaping aesthetics.
    - "Developers just want to get a building permit for the lowest cost, and they don't care what the landscaping looks like." (This opinion was shared by another landscape architect from a different state.)

6. Comments/Complaints of Landscape Architects' Clients

Five landscape architects stated their clients are mostly concerned about the financial impacts of waterwise landscaping and related ordinances, while the remaining three interviewees stated their clients had not expressed any opinions whatsoever.

Clients' opinions on waterwise landscaping and waterwise landscaping ordinances:

- "They like it. I think the main thing they like is that their water bills are one-half or one-third of what they'd be otherwise. Saving money makes them smile."
- It's "increased awareness of the water situation" but clients are "mostly concerned with the budget."
- "It's just accepted. For a number of my clients their real concern is economics. They *want* to use the minimum amount of water possible, so they don't have to pay for it."
- "*Money* is the issue—nobody likes to waste money." Therefore, clients profess to like waterwise landscapes and large developers request "low maintenance, drought-tolerant" landscapes because then the water meter fees and water usage costs are lower. This interviewee stated, "Economics is a much better controlling mechanism for reducing water use than the entire ordinance itself."
- "The builders probably aren't pleased with the turf limits. It's much more expensive to use [more than the normally allotted amount of] turf, as [then] you must use effluent water to irrigate it" and the costs associated with irrigating with effluent water are high.

7. Recommendations on Drafting Waterwise Landscaping Ordinances

I asked the eight landscape architects what specific recommendations they had for planning departments considering waterwise landscaping ordinances. Their responses to previous questions already contained insights and suggestions, but this question elicited additional ideas, which were specifically intended to help ensure fair and effective ordinances. Their responses ranged from how they recommended ordinances be enforced to what the ordinances should include. Three wanted better enforcement, more precision in the ordinances' rules (less "one size fits all"), and/or more flexibility. Five interviewees had specific recommendations for what to include in an ordinance, including two people that had opposing opinions on effluent irrigation. Three landscape architects stated they thought waterwise landscaping ordinances were important for communities to have, as they increase awareness of water use. One of these interviewees also was careful to point out that although it's good to have a landscape "that looks pleasing and can sustain itself without irrigation," ordinances should "make people feel like open space and landscape are a part of completing the urban picture and are *not* a resource drain."

Details on recommendations for planning departments considering adopting waterwise landscaping ordinances:

- Consider how the ordinance should be written and enforced.
    - One landscape architect stated that water is "too important throughout the west" to not have a waterwise landscaping ordinance. However, "The planning department has to have review capacity -- the personnel and the document to review."
    - Another landscape architect wanted "a clause to allow for *flexibility*, as long as [the landscape is] drought tolerant, aesthetically pleasing, and compatible with the surrounding area." He related that "The hands of some reviewers are tied—they're afraid to go against the code."

- Consider what to include in the ordinance.
    - One landscape architect stated that if people use effluent or well water they should be allowed as much water intensive landscaping as can be irrigated with this water.
    - The opposite opinion also came in: "In [name of community] there's graywater available in some areas, but instead of encouraging desert plants, they now say you can plant anything if you use graywater on it. That's not good. That's taking a step backwards to the '70s."
    - "A plant list would be helpful."
    - "Lawns, because they use so much water, are important to include," including specifying maximum amounts of lawn and what species are allowed.
    - Regulate outside water features, such as fountains, waterfalls, etc.
    - Minimize wall-to-wall groundcover plantings. The landscape architect who suggested this stated that trees "can be on deep bubbling circuits, separate from everything else, and require little water. But the living ground cover under the trees requires a great deal more water…. Trees with mulch under them use much less water. Therefore, require living groundcovers *judiciously*, and allow mulch instead."
    - "Pay more attention to irrigation technology. Take advantage of the automatic sprinkler systems that dial in daily for [evapotranspiration]. It's an expense, but it's appropriate for some projects. With modern irrigation systems we can now support plant material that is more thirsty with less water than used on *regular* plants before. Irrigation is the most important part. Balance the ordinance between plants and irrigation."

Section X. Cited References

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Section XI. Appendix

Contents

Figure 2. The Eleven Communities' Average Precipitation
May through September

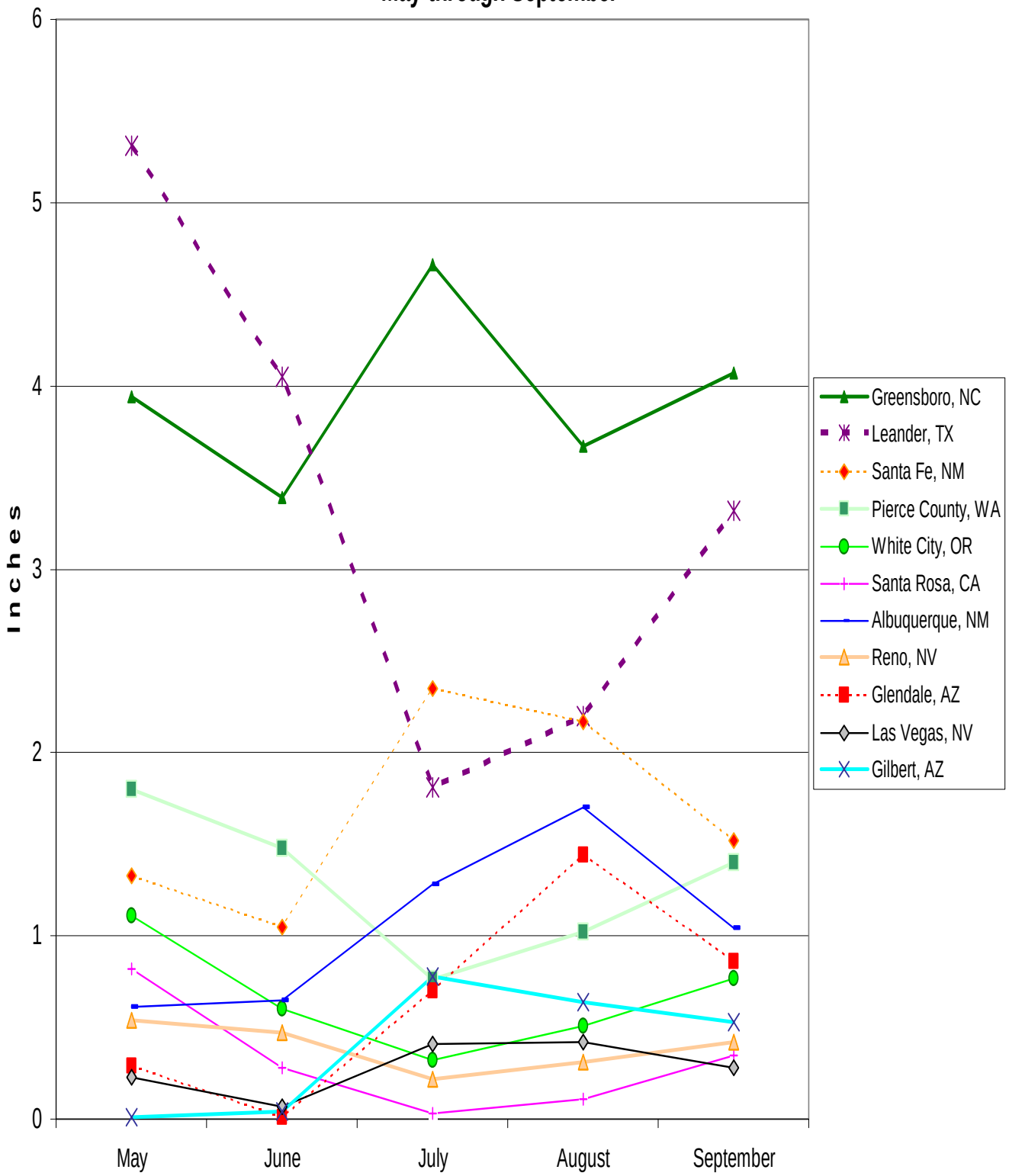

Figure 3. The Eleven Communities' Average Evapotranspiration May through September

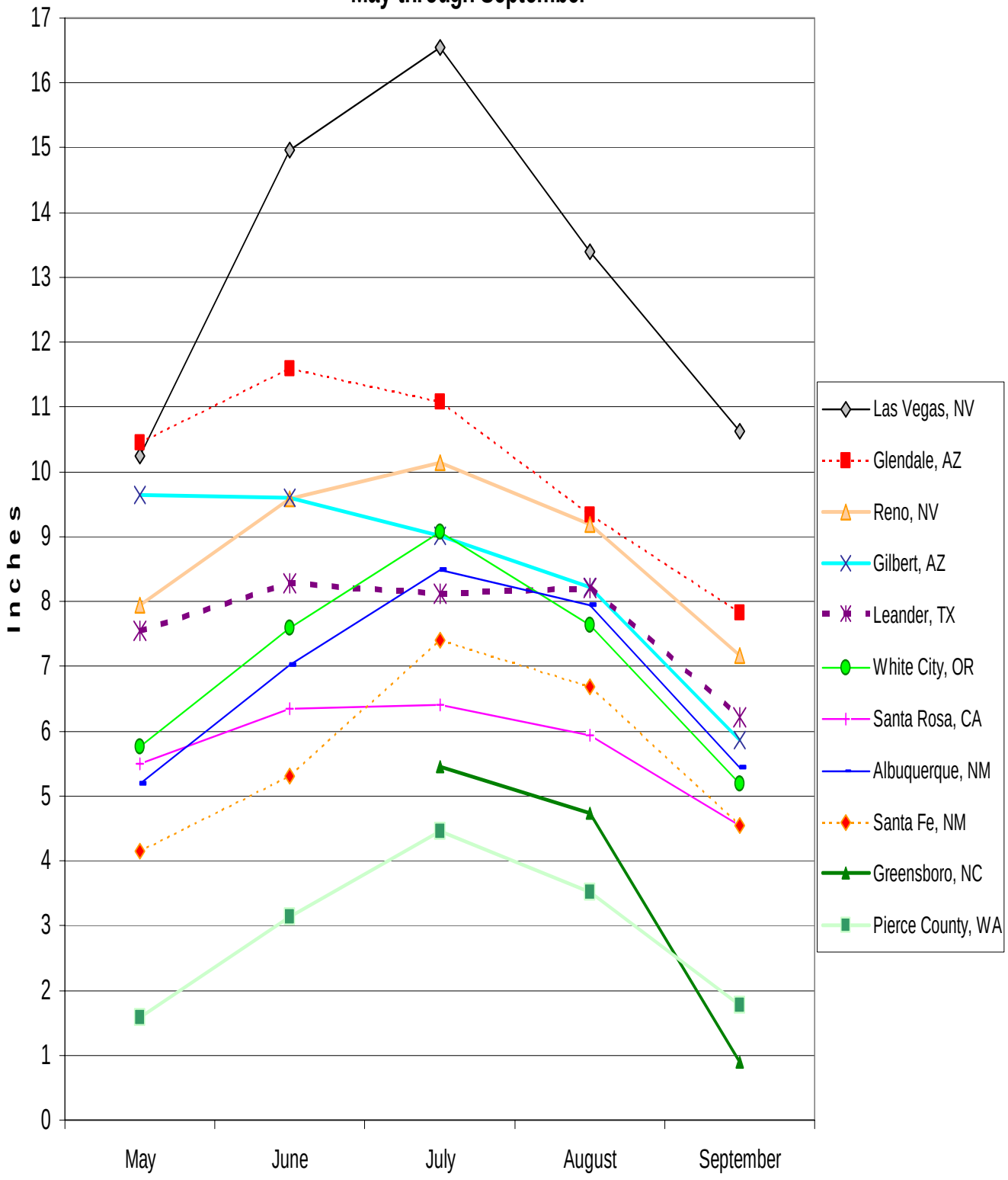

Figure 4. The Eleven Communities' Average Summer Water Deficit (Evapotranspiration - Precipitation)