

**THE ROLE OF PUBLIC GARDENS
IN PROMOTING
WATER-WISE LANDSCAPING**

by

Daniel Brewster Stern

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment
of the requirements for the degree of Master of Science in Public Horticulture

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Daniel Brewster Stern

Approved: _____

Robert E. Lyons, Ph.D.
Professor and Director, Longwood Graduate Program

Approved: _____

Blake C. Meyers, Ph.D.
Chair of the Department of Plant and Soil Sciences

Approved: _____

Robin W. Morgan, Ph.D.
Dean of the College of Agriculture and Natural Resources

Approved: _____

Debra Hess Norris, M.S.
Vice Provost for Graduate and Professional Education

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TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
ABSTRACT	ix
INTRODUCTION	1
LITERATURE REVIEW	5
A Brief History of the Water-wise Landscaping Movement.....	5
Advocacy, Public Gardens, and Water Conservation	8
The Challenge of Behavioral Change.....	10
METHODOLOGY	16
Professional Level	18
Organizational Level	20
Individual Level.....	30
RESULTS	32
Institutional Survey	32
Case Studies.....	39
Case Study Summaries	39
Cross-Case Analysis	67
Case Study Interviews	69
Visitor Survey.....	80
DISCUSSION.....	82
Analysis	83

Collaborations	83
Marketing	87
Actionable Recommendations / Resources	91
Evaluation.....	94
Summary.....	96
Recommendations	99
References:	101
Appendix A: Research Protocol for Survey of Institutional Members of the American Public Gardens Association.....	112
Appendix B: Human Subject Review Board Approval of Research Protocol for Institutional Members of the American Public Gardens Association	120
Appendix C: Invitation to Participate in Online Survey of Institutional Members of the American Public Gardens Association.....	121
Appendix D: Demographics of Respondents and Organizations in Survey of Institutional Members of the American Public Garden Association.....	122
Appendix E: Case Study Selection Questionairre	132
Appendix F: Research Protocol for Interviews of Public Garden Staff.....	133
Appendix G: Research Protocol for Interviews of Non-Garden Key Informants	135
Appendix H: Human Subject Review Board Approval of Research Protocol for Interviews with Public Garden Staff	137
Appendix I: Human Subject Review Board Approval of Research Protocol for Interviews with Non-Garden Key Informants.....	138
Appendix J: Research Protocol for Visitor Survey at the Water Conservation Garden in El Cajon, California.....	139
Appendix K: Human Subject Review Board Approval of Research Protocol for Visitor Survey at the Water Conservation Garden in El Cajon, California....	145
Appendix L: Demographics of Respondents in Visitor Survey at the Water Conservation Garden in El Cajon, California.....	146

LIST OF TABLES

Table 3.1	The Characteristics of the Domestic Case Study Sites Used in the Research on the Role of Public Gardens in Promoting Water-wise Landscaping.....	21
Table 3.2	Coding System Used for Interview Participants in the Research on the Role of Public Gardens in Promoting Water-wise Landscaping.	25
Table 4.1	Merged Finding Matrix Showing the Degree of Manifestation of Various Outreach Strategies in Campaigns to Promote Water-wise Landscaping Found at the Five Case Study Sites.....	67
Table D.1	Distribution of Respondents by Position in American Public Gardens Association Institutional Survey	122
Table D.2	Geographic Distribution of Responding Institutions by State / Country in American Public Gardens Association Institutional Survey	123
Table D.3	Distribution of Responding Institutions by Region in American Public Gardens Association Institutional Survey	126

LIST OF FIGURES

Figure 2.1	Diagram of the Theory of Planned Behavior	12
Figure 2.2	Visual Model of Community-Based Social Marketing	14
Figure 3.1	The Three-tiered Approach Used to Examine the Role of Public Gardens in Promoting Water-wise Landscaping.....	17
Figure 4.1	Regional Importance of Practicing Water Conservation Amongst Institutions Responding to American Public Gardens Association Survey.....	32
Figure 4.2	Regional Importance of Public Education about Water Conservation & Water-Wise Landscaping Amongst Institutions Responding to American Public Gardens Association Survey	33
Figure 4.3	Proportion of Responding Institutions in American Public Gardens Association Survey Collaborating with Various External Allies to Promote Water-wise Landscaping	34
Figure 4.4	Regional Distribution of Institutions in American Public Gardens Association Survey Providing Information or Resources to the General Public about Water-wise Landscaping	35
Figure 4.5	Proportion of Institutions in American Public Gardens Association Survey Providing Various Types of Information About Water-wise Landscaping	36
Figure 4.6	Proportion of Institutions in American Public Gardens Association Survey Using Various Vehicles to Provide Information About Water-wise Landscaping	37
Figure 4.7	Perceived Value of Different Types of Information / Resources About Water-wise Landscaping as Rated by Visitors Participating in Survey at the Water Conservation Garden in El Cajon, California.....	80

Figure 4.8	Perceived Helpfulness of Various Modes of Communication for Conveying Information About Water-wise Landscaping as Rated by Visitors Participating in Survey at the Water Conservation Garden in El Cajon, California.....	81
Figure 5.1	Model of a Water-wise Landscaping Campaign Showing the Potential Relationships and Collaborative Endeavors Between Public Gardens and Other Stakeholders.....	100
Figure D.1	Distribution of Responding Institutions by Type in American Public Gardens Association Survey	127
Figure D.2	Distribution of Responding Institutions by Annual Operating Budget in American Public Gardens Association Survey	128
Figure D.3	Sources of Funding Amongst Responding Institutions in American Public Gardens Association Survey	129
Figure D.4	Distribution of Responding Institutions by Annual Visitation in American Public Gardens Association Survey	130
Figure D.5	Distribution of Responding Institutions by Number of FTE Staff in American Public Gardens Association Survey	131
Figure L.1	The Importance of Various Factors in Motivating Respondents to Visit the Water Conservation Garden in El Cajon, California.....	148

ABSTRACT

Trends in population growth, development and global climate change are increasing the risks of water scarcity around the world. One step towards greater conservation of this resource is reducing the discretionary use of water in the cultivated landscape. This study examined the role of public gardens in promoting water-wise landscaping through a mixed methods research approach. Two surveys were conducted to compare the alignment of public gardens' educational outreach about water-wise landscaping with the preferences of garden visitors. In addition, several exemplary cases were investigated and interviews were conducted with public garden staff and their external allies in water-wise landscaping campaigns.

Public gardens are well positioned to facilitate the adoption of water-wise landscaping by engaging their communities about the importance of conserving water, demonstrating best practices and providing information to help people change their behavior. The data informed a suite of recommendations about how gardens can partner more strategically with other stakeholders and tailor their own educational outreach to be more effective. Specific themes included enhancing collaboration through formal relationships and financial incentives, tactics for improving marketing and communication, providing relevant demonstration gardens and more actionable information and resources, and program evaluation. While the promotion of water-wise landscaping is the central theme of this study, selected recommendations may have transferability to public garden advocacy on other environmental issues as well.

Chapter 1

INTRODUCTION

Background on Water Scarcity

Water is the lifeblood of earth's tremendous biological diversity and critical to human survival. However, trends in population growth and development suggest that humans are outstripping the planet's water supply. Exacerbated by the increasing temperatures and prolonged drought associated with global climate change, the risks of water scarcity are increasing around the world (Bates, 2008). A recent model published in the Journal of Hydrometeorology predicts that the percentage of earth's surface afflicted by drought could rise to 30% by 2100 (Burke, 2006). In light of these developing trends, in 1992 the United Nations designated March 22 of each year as "World Water Day" and has declared 2005-2015 the "Water for Life" decade. Through its inter-agency coordination entity, UN-Water, the United Nations has dedicated itself to working on "action-oriented activities and policies that ensure the long-term sustainable management of water resources" (United Nations, 2006). Although it is an understatement to say that United States has enjoyed a relative abundance of water when compared with other parts of the world, even its ability to meet increasing demands is tenuous. Nothing should drive this point home harder than the General Accounting Office's 2003 Freshwater Supply report to Congress which indicated that water managers from 36 states "anticipate water shortages locally, regionally or statewide within the next ten years" (General Accounting Office, 2003).

The Need for Greater Water Conservation

In order to reduce our water consumption to a more sustainable level we need to change both attitudes and behavior. This is particularly true in the United States where per capita daily usage is three times more than European averages, which are themselves higher than developing parts of the world (Graves, 1993). According to the United States Geological Survey, “Consumptive use of water for residential purposes [indoor and outdoor] constitutes about 26% of total use” (Solley, 1998). When water shortages have made it apparent that our usage is outpacing the hydrological cycles that govern this resource, many municipalities have attempted campaigns to reduce consumption. Water conservation consultant Amy Vickers has lamented that these measures have only been invoked during severe droughts and rarely have lasting effects on consumer demand. Arguing for a more sustainable model of resource use, Vickers advocates a new “water ethic” and building, “a water trust, [as] an endowment that generations to come can rely on for their own security and prosperity” (Vickers, 2001).

Water-Wise Landscaping

A necessary step towards the goal of sustainable water use is reducing discretionary use of water to maintain the cultivated landscape. Although amounts vary in response to regional differences in climate, outdoor use represents an average of 30% of residential water consumption and accounts for approximately 7.8 billion gallons per day in the United States (Solley, 1998). Of this, 80-90% is used to irrigate gardens and lawns, the latter consuming an average of 10,000 gallons of supplemental

water each year per lawn (Fenyvesi, 1996). According to United States Environmental Protection Agency estimates, more than 50 percent of water used in commercial and residential irrigation goes to waste due to overwatering, inefficient irrigation design, and evaporation (U.S. Environmental Protection Agency, 2008).

Clearly, reforms to conventional landscaping choices and management practices are needed in order to reduce our consumption of this precious resource. The concept of water-wise landscaping is a different approach to garden design and maintenance that promotes water conservation and represents a partial solution to the growing problem of water scarcity. The idea can be traced back to the late 1970s when conservationists in Denver, Colorado identified seven basic principles of water saving landscapes and coined the term Xeriscape™. Comparative studies have demonstrated that, when used in concert, these techniques can reduce water consumption by a third compared to conventional landscapes (Sovocol, 2005).

Research Goals and Process

This thesis was born out of the researcher's interest in public gardens acting as models of and advocates for pro-environmental behavior. The specific issue of water conservation was of interest to the researcher due to previous experience working at a public garden in the southeastern United States during two major droughts. During these episodes, the community looked to the garden for resources to help them develop and maintain their landscapes more successfully with less water.

Many public gardens are endeavoring to promote water-wise landscaping in a variety of ways, ranging from demonstration gardens and recommended plant

lists, to lectures, classes, and professional workshops (Eberhardt, 2007; Willison, 2007). In addition to their “in-house” efforts, some have formed alliances with external partners who are also interested in water conservation (San Diego County Water Authority, 2007, American Public Gardens Association, 2010).

The purpose of this thesis research was to identify specific strategies that are most effective in changing behavior, and develop a model to help public gardens promote water-wise landscaping. Accordingly, this study examined the experiences of seasoned professionals and well established water conservation programs. In addition to U.S. case study sites, this research investigated water-wise landscaping campaigns in Australia, the driest inhabited continent on earth and a country undergoing rapid development, similar to that of the United States. Exacerbated by climate change, Australia’s chronic drought has combined with population growth to put additional pressure on the country’s limited water supply (Gray and Riley-Chetwynd, 2009).

While no particular theoretical framework was adopted at the onset of this research it did have a role in deepening the researcher’s understanding of the issue. Beginning with the initial literature review the researcher encountered numerous articles regarding the psychology of pro-environmental behavior and its application in conservation campaigns. Throughout the research, these ideas helped the researcher to better understand the phenomena observed at the different case study sites and interpret the findings in a broader context. In particular, the *theory of planned behavior* and the principles of *community-based social marketing* resonated with the finding of this research and were instrumental in conceptualizing a model for the recommendations for public gardens interested in promoting water-wise landscaping.

Chapter 2

LITERATURE REVIEW

A Brief History of the Water-wise Landscaping Movement

One of the first strategies to reduce landscape water consumption was the promotion of the concept of xeriscaping. A trademarked term, derived from the Greek “xeros” (dry) and “landscape,” Xeriscape™ was first conceived and promoted in Colorado by Denver Water and the Front Range Xeriscape Task Force in the late 1970s. Xeriscape™ incorporates seven principles, including proper planning and design, soil analysis, appropriate plant selection, practical turf areas, efficient irrigation, use of mulches, and appropriate maintenance.

Despite research showing that xeriscaping could usually reduce landscape water consumption by one-third however, many people were initially reluctant to substitute it for conventional landscaping. A common perception was that xeriscapes were drab and barren and featured nothing more than rocks and cacti. These sentiments were evident in the popularization of the term “zero-scape,” a derisive play on words, which suggested that these gardens required no resources because they lacked any real horticulture. Early surveys suggested that the public needed more examples of well-executed, and aesthetically pleasing xeriscapes before committing to a xeriscape conversion (Thayer, 1982). In 1986, the National Xeriscape Council, Inc. (NXCI) was formed as a non-profit organization to, “promote, encourage, assist,

facilitate and establish community programs for water conservation achieved through sound landscaping practices” (Latta, 2010). Over the years, NXCI has had chapters in over 40 states and is currently headquartered in Atlanta, Georgia (Alvis, 2007).

Realizing that positive attitudes were prerequisite to the adoption of xeriscaping, NXCI, its affiliates, and other organizations began developing videos, educational programs, and other publications geared at increasing awareness of water scarcity and improving public perception of xeriscapes. For example, researchers at Washington State University produced an informational video in 1989 entitled *Water-Conserving Landscapes, Beautiful, Inviting*, which contained “basic information about the status of water problems from a national and global perspective, methods to conserve water in the landscape, and positive images of well-designed, water-conserving landscapes” (Lohr and Bummer, 1992). Similarly, a series of xeriscape workshops put on by Texas Tech University in 1994 was reported as having had a positive effect on participants’ attitudes and perceptions of water conserving landscapes and a demonstrable effect on increasing participants’ knowledge about the principles of xeriscaping (McKenney and Terry, 1995). Over the next several years, xeriscape councils, regional water authorities, cooperative extension agencies and other organizations also helped in the development of several books and countless brochures extolling the virtues of, and trying to nurture an appreciation for, xeriscaping. In addition, many of these organizations began promoting local demonstration gardens established at libraries, schools, parks, and other municipal properties where the public could see good examples of xeriscapes. More recently, and in an effort to distance themselves from the negative connotations associated with the

term “xeriscape”, other promoters have begun using phrases like “water-wise landscaping” instead.

Recent years have also seen the introduction of several new regional and national branding campaigns to promote water conservation. The *Water - Use It Wisely* campaign, which started in Arizona in 1999, was designed around “messaging hooks” intended to remind consumers to think about ways they can save water through everyday buying choices. The campaign’s catchy marketing approach has attracted almost 400 participating government agencies and other organizations across the country as well as commercial sponsors such as Home Depot, Lowes, Rain Bird, and Hinz Horticulture (*Water - Use it Wisely*, 2010). In 2006 the U.S. Environmental Protection Agency launched *WaterSense*, a partnership program that “seeks to protect the future of our nation's water supply by promoting water efficiency and enhancing the market for water-efficient products, programs, and practices” (*WaterSense*, 2010). *WaterSense* has worked with product manufacturers and landscape irrigation professionals to establish a labeling and certification program that helps consumers identify water-efficient goods and services. In addition, *WaterSense* has engaged over 250 governmental agencies and non-profit organizations as promotional partners.

Concurrent with these efforts, private industry became much more involved in the water-wise landscaping movement as well. In 2004, the Professional Landcare Network (PLANET), an international association serving green industry professionals, joined forces with the American Nursery and Landscape Association, the Irrigation Association, and Turfgrass Producers International to form the Green Associations Water Conservation Council (Professional Landcare Network, 2010).

The motivation behind the formation of the council could be summed up by the words of Tom Delaney, PLANET's director of government affairs, who said, "If you don't have water, you're out of business. Then we're in the AstroTurf® business" (Rain Bird (a), 2010). After its inception, the Green Associations Water Conservation Council created a Water Action Guide to help green industry professionals work more effectively with local government and other decision makers to craft water resource management policy (Green Associations Water Conservation Council, 2008).

Another manifestation of the green industry's involvement has been the Intelligent Use of Water™ (IUOW) campaign established in 2004 by Rain Bird as "a forum to further define the relationship between water conservation and landscape water use" (Rain Bird (b), 2010). Since then, Rain Bird has held 11 IUOW Summits at locations around the world, recognized outstanding water conservation efforts through IUOW leadership awards, and sponsored an annual IUOW film competition (Rain Bird (b), 2010).

Advocacy, Public Gardens, and Water Conservation

The advocacy role of cultural institutions in the United States can be traced back to the late 1930s. In his seminal 1939 work, *The Museum and Popular Culture*, Thomas Adam described museums as both "powerful instruments of popular education affecting the social history of our people," and "modern weapons in the struggle for popular enlightenment" (Adam, 1939). In an address to the American Association of Museums around the same time, Morse Cartwright said, "I think the museum too, must realize its responsibility from top to toe as an agency for molding

as well as reflecting public taste and opinion” (Cartwright, 1939). This paradigm shift in the museum profession was galvanized in Theodore Low’s 1942 work, *The Museum as a Social Instrument*, in which he argued, “The only real justification for the existence of a museum lies in its degree of usefulness to society,” and that museums, “have a distinct moral duty to the community in which they are situated” (Low, 1942). Low also posited that it is in the field of popular education, specifically that of adults, that museums can make their “greatest contribution to the total cause of education,” and described the opportunity of museums, “with their potentiality of reaching millions of our citizens...to make people see the truth [and] recognize the importance of the individual as a member of society” (Low, 1942).

These sentiments about advocacy have been echoed with respect to public gardens as well. In her research on increasing environmental awareness through horticulture, Peck (1978) stated, “gardens are in a position not only to disseminate information but also to influence public attitudes toward plants, beauty, and the natural environment, and they should consider this an important obligation”. Similarly, in research on advocacy of public gardens related to tropical rainforest conservation, Allenstein (1990) commented that public institutions have a role “not only to reflect social views, but to help individuals form opinions”. She goes on to say, “Public gardens have a great opportunity to assume a leadership role by demonstrating active support of environmental issues...and can provide forums for public discussion and debate about current issues, and assist them in finding ways to take action” (Alenstein, 1990).

This call to action for public gardens has intensified in recent years, as evidenced by the dedication of several issues within the profession's journals to sustainability-related advocacy. A 2007 issue of *The Public Garden* was devoted to *Education and Sustainability* and explored the challenges and opportunities for the profession to motivate behavioral change. Similarly, a 2009 issue of BGjournal entitled *The Challenge of Sustainability* investigated the efforts of public gardens worldwide to tackle global climate change and sustainable development.

Within this context, water conservation has been identified as one specific issue on which public gardens can take a leadership role. In 2007, Botanic Gardens Conservation International devoted an issue of their semiannual education review, *Roots*, exclusively to water conservation. Editor Julia Willison began the issue by asserting that, “[public gardens] can and are playing a major role in educating people about the critical association between plants and water and empowering them to change their behaviour and attitudes towards a wiser use of water” (Willison, 2007). The rest of the issue featured articles highlighting ways in which different gardens were addressing the topic through their displays, interpretation and programming.

The Challenge of Behavioral Change

In her research on increasing environmental awareness, Peck (1978) asserted that horticulture provides an opportunity to nurture a sense of need to protect natural resources in adults. Peck goes on to say that, “The ultimate purpose of [such] learning is change, particularly change in behavior”. The difficulty in doing so,

however, was anticipated by Allenstein (1990), who, in her research on advocacy and public gardens, wrote,

“Effecting change in the attitudes of individuals and society as a whole can be difficult. Effecting change in the behavior of those individuals can pose even greater challenges, while attempting to change the behavior of society at large may seem impossible.”

The challenge remains the same today as noted by Wolf who wrote in a recent issue of *The Public Garden*, “merely informing the visitors and the public is no longer a high enough bar. The vision is to change behavior for the benefit of local and global environments” (Wolf, 2007).

Environmental psychologists have been studying the true motives of pro-environmental and conservation behavior for decades (Wolf, 2007). Several have criticized the tendency toward information-intensive approaches that reflect a traditional model of environmental education that posits, “increased knowledge leads to favorable attitudes... which in turn lead to action promoting better environmental quality” (Hungerford and Volk, 1990). In fact, several studies have shown only weak correlations between conservation knowledge and conservation behavior (Moore, et al., 1994; Vining and Ebreo, 1992).

Many alternate theories have emerged from the field of psychology to try to explain the factors related to behavior. Amongst these, the *theory of reasoned action* and its derivative, the *theory of planned behavior*, have emphasized an individual’s intentions to perform a specific behavior (Vining and Ebreo, 2002). The rationale for their focus is that intentions, when measured close to the time when an

action could be performed, are often the strongest predictors of behavior. First introduced by Ajzen in 1988, the *theory of planned behavior* (Fig 2.1) posits “three conceptually independent determinants of intention as described below:

The first is the *attitude toward the behavior* and refers to the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question. The second predictor is a social factor termed *subjective norm*; it refers to the perceived social pressure to perform or not to perform the behavior. The third antecedent of intention is the degree of *perceived behavioral control*...the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience and well as anticipated impediments and obstacles. (Ajzen, 1991)

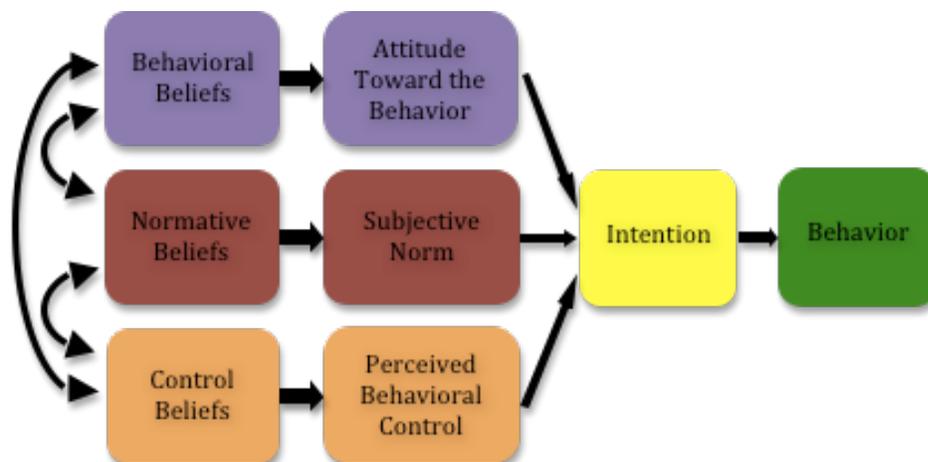


Figure 2.1 Diagram of the Theory of Planned Behavior (adapted from Ajzen, 2006)

Other research on conservation behavior has lent support to the major tenets of the theory of planned behavior. For example, Berk and Oliver have also suggested that the desire to conform to perceived socially desirable “community

norms” is an important behavioral motivator (Berk, 1993; Oliver, 1999). Similarly, research on the diffusion of water conservation ideas indicates that a community’s “opinion leaders” may also strongly affect behavioral change (Athanasiadis and Mitkas, 2005). With regard to the effect of perceived behavioral control, Spinti noted that a 25% gap persists between “willing” and “actual” adopters of water-wise gardening, indicating that some barriers are preventing greater adoption (Spinti, 2004).

The theory of planned behavior has demonstrated strong predictive power with respect to environmental behavior, in general and with respect to water conservation in particular (Vining and Ebreo, 2002). Accordingly, it has had a significant impact on the recent evolution of conservation campaigns by calling attention to the effect of perceived societal norms and the importance of identifying and removing barriers to behavioral change (Chenoweth, et al., 2008).

A major development in conservation campaigns has been the application of social marketing techniques. First introduced by marketing experts Kotler and Zaltman, social marketing has been defined as, “The use of marketing principles and techniques to influence a target audience to voluntarily accept, reject, modify or abandon a behaviour for the benefit of individuals, groups or society as a whole” (Kotler, et al., 2002). Over the years, social marketing has been incorporated into several water conservation campaigns (Hoffman, 2006; Wilbur, 2006), including *Florida’s Water – It’s Worth Saving* (Jespersion, 2005), and *DurhamSavesWater* (Silva, 2009). More recently however, water conservation experts have asserted that such campaigns need greater emphasis on communicating conservation as normative behavior, and propose a “social-norm” marketing approach (Hoffman, 2009). This

strategy seeks to capitalize on the sentiment expressed by Arizona State University psychology professor, Robert Cialdini, who said, “What’s appropriate to do, in most people’s minds, is what other people like them do” (Shea, 2007).

Another variant of social marketing is Community-Based Social Marketing (CBSM). First championed in 1996, CBSM (Fig. 2.2) provides a model for the development and evaluation of conservation behavior campaigns. The four major steps of CBSM are 1) identifying and removing barriers to the desired behavior, 2) developing a strategy that utilizes “tools” proven to be effective in changing behavior, 3) piloting the program and 4) evaluating its performance (McKenzie-Mohr and Smith, 1999). The specific “tools” recommended in CBSM are commitment, prompts, social and community norms, effective communication, incentives, and convenience (McKenzie-Mohr and Smith, 1999).

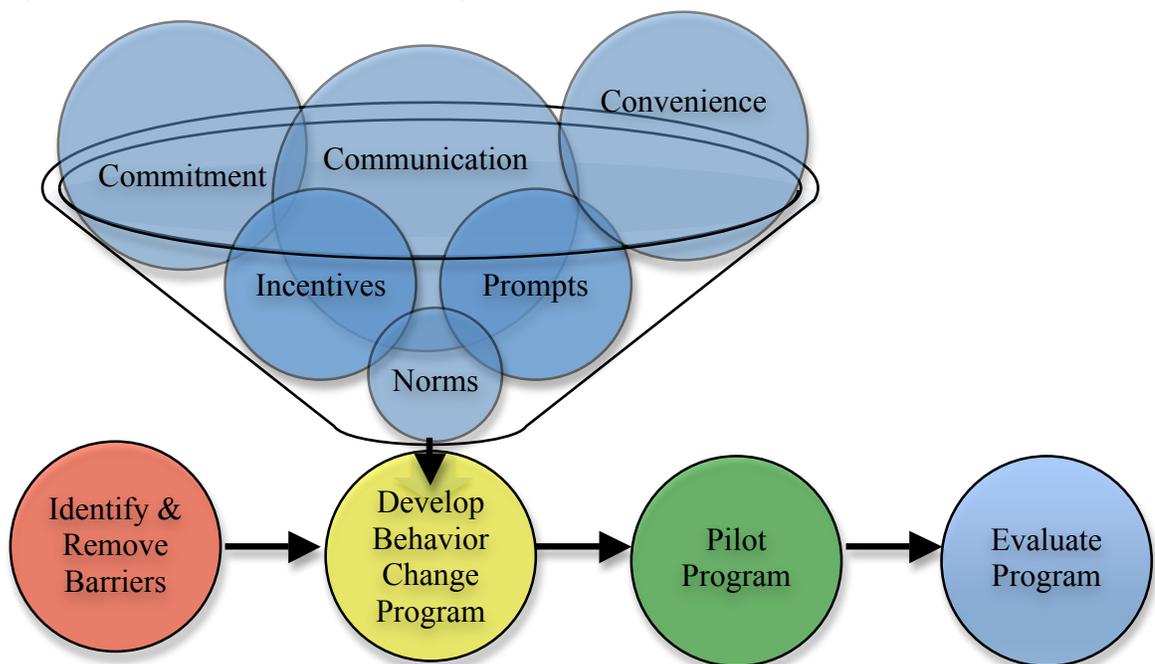


Figure 2.2 Visual Model of Community-Based Social Marketing

In a case study of this approach, student cyclists canvassed communities outside of Toronto, Canada to talk with residents about water shortages and distribute conservation kits consisting of a lawn- watering gauge and reduction pledges. Compared with households that only received an informational packet, those visited by cyclists achieved greater reductions in outdoor water use - suggesting that personal interaction and community reinforcement were effective in motivating change (McKenzie-Mohr, 2000). Since its introduction, CBSM has been used by a variety of campaigns to motivate conservation behavior including Denver Water's *Use Only What You Need* campaign (Chenoweth, 2008; Chavez, 2009; Community-Based Social Marketing, 2010).

The review of the literature suggests that the water-wise landscaping movement is picking up momentum and that public gardens are in a unique position to advocate for and facilitate its adoption. There has also been a great deal of progress in terms of understanding environmental psychology and the nuances of behavioral change. This thesis will examine how public gardens can use these strategies to communicate more effectively about the issue, model the desired behavior and empower the public to achieve greater water savings in their own landscapes.

Chapter 3

METHODOLOGY

Overall Research Design

This study utilized a three-tiered research approach (Figure 3.1) that incorporated both qualitative and quantitative methodologies. The outermost tier, professional, examined the current state of educating the public about and promoting the adoption of water-wise landscaping across the field of public gardens. The middle tier, organizational, investigated “best practices” of exemplary institutions through case study analysis. The innermost tier, individual, assessed specific needs and preferences of garden visitors with respect to learning about water-wise landscaping. These three tiers were designed to complement one another and yield a more holistic understanding of the advocacy role of public gardens with respect to water-wise landscaping.

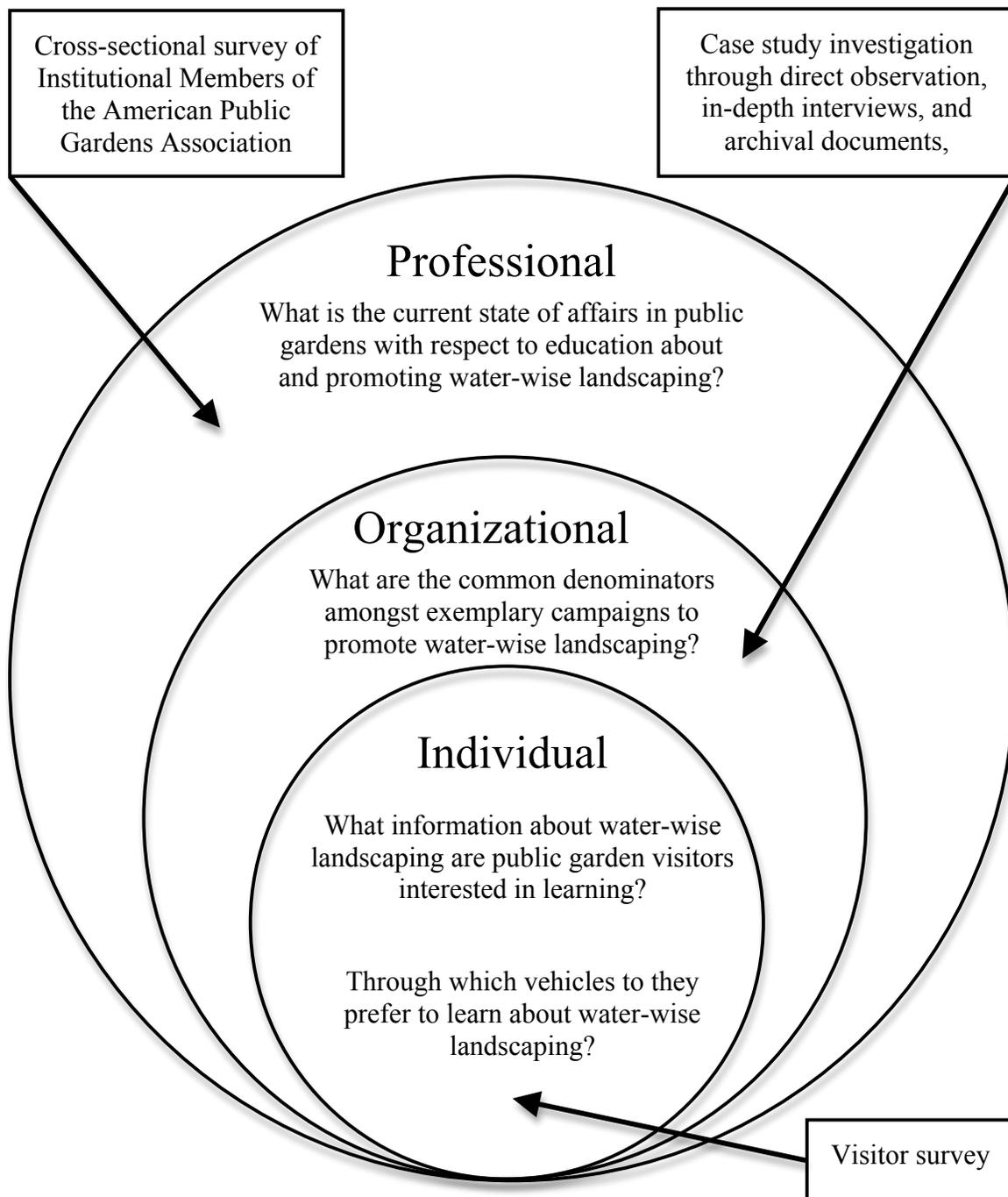


Figure 3.1 The Three-tiered Approach Used to Examine the Role of Public Gardens in Promoting Water-wise Landscaping

Professional Level

Institutional members of the American Association of Public Gardens (APGA) were surveyed according to Dillman's tailored design method (Dillman, 2009) to better understand the current state of water-wise landscaping across public gardens (Appendix A). Closed-ended questions with multiple and mutually exclusive categories were used to obtain demographic information about a respondent's institution (Dillman, 2009). Information about the centrality of water-wise landscaping education to the institution's mission were asked using closed-ended nominal and unipolar ordinal scale questions (Dillman, 2009). All research protocol and survey questions were exempted from full Human Subject Review Board review by the Director of Compliance in the Research Office at the University of Delaware (Appendix B).

The institutional survey was beta-tested by the thesis committee prior to online distribution using Qualtrics™ (Qualtrics, 2010). To minimize the potential for bias by extreme reactions to intense summer heat, the survey was not conducted until the fall of 2009 when responses were collected over a three and a half week period.

A list of 498 institutional members was obtained from APGA on August 18, 2009. Listings without email addresses were removed. An invitation with a hyperlink to the online Qualtrics™ survey was sent via email to the remaining 465 institutional members on September 20, 2009 (Appendix C). Permanent email address errors resulted in the delivery failure of 28 emails, leaving 437 potential recipients of the original invitation. A reminder email was sent to the same list of 437 recipients on October 1, 2009 and responses were accepted through October 14, 2009. Of the 437

potential recipients, 140 (32.0%) responded with 127 (29.1%) completing the entire survey. The demographics of survey respondents and their institutions are presented in Appendix D of this thesis. When compared with recent benchmarking studies of the American Public Garden Association, the distribution of respondents to this survey seem fairly representative of the institutional members of the association as a whole (American Public Gardens Association, 2007; EMD Consulting Group, 2008). Following survey closure, responses were exported from Qualtrics™ to a spreadsheet and statistical analyses were conducted using JMP 8.0 software (JMP, 2010).

Organizational Level

Case studies were conducted to gain greater insight into the potential role of public gardens in the promotion of water-wise landscaping. Identification of case study institutions began in fall 2008 and was informed by literature review and recommendations obtained during informal interviews with water conservation experts. Each potential case-study site was a public garden making a concerted effort to educate its community about water-wise landscaping, and each completed a short questionnaire (Appendix E) to describe these efforts as well as provide demographic information about their institution.

Domestic Case Studies

Four public gardens were selected to serve as the hub of domestic case study sites following a purposeful sampling approach. As noted by Patton (2002), this approach can yield findings of common patterns as well as important idiosyncrasies that help in understanding and generalizing about a particular phenomenon. Accordingly, these gardens were selected to represent institutions of different size, organization, and financial resources, as well as variation in geographic distribution and annual precipitation. The gardens chosen to serve as hubs in the domestic case-study sites for this research, along with some of the details regarding their heterogeneity are presented in Table 3.1. A more detailed description of each case study garden is presented in Chapter Four.

Table 3.1 The Characteristics of the Domestic Case Study Sites Used in the Research on the Role of Public Gardens in Promoting Water-wise Landscaping.

Institution	Location	Type of Organization	Annual Operating Budget	Annual Visitation	Avg. Annual Precipitation in inches
Denver Botanic Gardens	Denver, CO	Independent 501(c) 3	\$10.5 Million	600,000+	15.8
Water Conservation Garden	El Cajon, CA	Joint Powers Authority of local water agencies	\$700,000	52,000+	10.8
San Antonio Botanic Garden	San Antonio, TX	Subsidiary of Municipal Parks & Recreation Department	\$2.6 Million	92,000+	32.9
North Carolina Botanical Garden	Chapel Hill, NC	Non-academic University Department	\$750,000	45,000+	43

Data Collection Strategy for Domestic Case Study Sites

Data from each of the four domestic case studies sites was collected in accordance with the “six sources of evidence” identified by Yin, including direct observation, interviews, archival records and other forms of documentation (Yin, 2009). Site visits to each of the case study gardens were made to observe their strategies to promote water-wise landscaping in context. Additional information about these strategies was obtained from garden staff through a combination of questionnaires and personal interactions. Archival records and other forms of

documentation (e.g. related surveys, focus group findings, committee agendas and reports) related to these efforts were also collected from each of the case study sites.

Domestic Case Study Reports

The findings of this research led to the development of a preliminary report for each of the case study sites. Each report provided a brief overview of the relevant organizations, their efforts with respect to the promotion of water-wise landscaping, and any collaborative endeavors that had been undertaken on the issue. These reports served as the foundation of the case study summaries presented in Chapter Four, where the content has been reorganized into four headings that correspond to the major stakeholders found in water-wise landscaping campaigns, namely Public Garden, Water Utility, Cooperative Extension, and Green Industry.

Cross-case Analysis and Merged Findings

The reports from each of the domestic case study sites were then used in a “cross-case” analysis. Stake has described the utility of the cross-case approach in trying, “to understand [a phenomenon] – both its commonality and differences across manifestations” (Stake, 2006). In this research, the approach was used to address the question, “*What are the common denominators amongst exemplary models of campaigns to promote water-wise landscaping?*”

The specific cross-case approach used in this research was that of merged findings (Stake, 2006). The major themes from each of the case study sites were categorized into various “strategies” for promoting water-wise landscaping. A listing

of these strategies was then used to create a matrix, so that their manifestation across different case study sites could be compared more easily. This approach helped identify those strategies that were found in multiple case study sites as well as potentially significant outliers. The merged finding matrix is presented in Chapter Four.

Selection of Interview Participants

The individuals who participated in the interview portion of this research were identified through a naturalistic process, beginning with inquiries at each of the case study gardens. At each, the researcher was referred to specific staff members involved with the garden's public outreach and education. These individuals were interviewed (Appendix F) about their perceptions of the efficacy of water-wise landscaping campaigns, the motives and processes that informed their institution's decision to pursue particular strategies, what types of evaluation they were conducting, and the nature of any collaborations with external entities on the issue.

As "collaborations" emerged as a significant element at each of the case-study gardens, the garden staff also provided contact information for the specific individuals who could represent the external parties with whom they were working to promote water-wise landscaping. Subsequently, these key informants were also interviewed (Appendix G) for commentary on the efficacy of such campaigns and the evolution and mechanics of their relationship with the partnering public garden. The integration of perspectives from key informants both inside and outside the public garden yielded a more holistic understanding of collaborations with respect to the

promotion of water-wise landscaping. Input from different parties was also important in terms of safeguarding against participant bias and validating statements made during qualitative interviews. The interview participants consulted during this research are presented in Table 3.2 along with their respective organizational affiliation and interviewee code where one was assigned.

Table 3.2 Coding System Used for Interview Participants in the Research on the Role of Public Gardens in Promoting Water-wise Landscaping.

Interview Participant	Position / Organizational Affiliation	Code
Jennifer Riley-	Corporate Marketing Brand Manager / Rain Bird™ Corporation	IR1
Doug Chapman	Legislative Committee Member / North Carolina Green Industry Council	IR2
Ken Moore	Former Assistant Director / North Carolina Botanical Garden	PG1
Panayoti Kelaidis	Senior Curator and Director of Outreach / Denver Botanic Gardens	PG2
Peter White	Director / North Carolina Botanical Garden	PG3
James Ward	Associate Director for Horticulture / North Carolina Botanical Garden	PG4
Paul Redekker	Head Horticulturist / Water Conservation Garden	PG5
Sasha Kodet	Education Director / San Antonio Botanical Garden	PG6
Marty Eberhardt	Executive Director / Water Conservation Garden	PG7
Elizabeth Gardener	Suburban Conservation Coordinator / Denver Water	WA1
Carlos Michelin	Landscape Conservation Project Manager / San Diego County Water Authority	WA2
Karen Guz	Conservation Director / San Antonio Water System	WA3
Toby Roy	Water Conservation Manager / San Diego County Water Authority	WA4
William Granger	Water Conservation Manager / Otay Water District	WA5
Pat Davis	Sustainability Manager / Orange (County) Water and Sewer Authority	WA6
Mark Peterson	Conservation Project Coordinator / San Antonio Water System	WA7
Calvin Finch	Former Conservation Director / San Antonio Water System	WA8
James Klett	Board Representative of Plant Select® / Colorado State University Cooperative Extension	N/A
Laura Rogers	Bexar Country Master Gardener, Texas AgriLife Extension Service	N/A

Interview Protocol

Prior to their use, the interview protocols and questions were approved by the Human Subject Review Board in the Research Office at the University of Delaware (Appendices H & I). The questions were worded in an open-ended manner and presented in a standardized form to the participants via email. Some participants opted to provide additional detail about their respective cases by responding directly to this questionnaire via email. After their initial responses were recorded, follow up conversations via telephone were used to clarify specific points as needed. Other participants were engaged through full-length interviews in which the same set of questions was to be used as an interview guide (Patton, 2002).

The full-length interviews were conducted in person or over the telephone and ranged in length from 30-120 minutes, with most lasting about one hour. During the interviews, the exact sequence and wording of questions differed slightly to improve their relevance for different circumstances and elicit greater detail about respondents' unique perspectives (Patton, 2002). Although the added flexibility did increase the potential for participant reactivity, the researcher did assure subjects that the purpose of the research was to learn from their experiences rather than to evaluate their performance. Furthermore the researcher's extended relationship and follow up communication with interview subjects, coupled with the on site investigation at each of the case studies helped clarify and contextualize comments made during the interviews. As noted by Patton (2002), another drawback to using a flexible interview approach is that it can contribute to greater variation amongst responses thereby reducing their overall comparability. However, as the purpose of this research was to

learn from each of the case studies in their situational context, this was not deemed a major concern in this research. Rather than propose a universal and formulaic “solution” to the question of, “*How can public gardens promote water-wise landscaping most effectively?*” recurring themes were identified using generalized terms so that the findings could be interpreted and applied in a variety of scenarios.

All of the interviews in this research were digitally recorded to ensure accurate interpretation of participants’ opinions. These audio-files were reviewed and transcribed soon after the interviews. As the goal of these interviews was to understand general themes and opinions, non-verbal sounds, false starts, and lengthy digressions were omitted.

Analysis of Case Study Interviews

Interview transcriptions were reviewed to identify preliminary themes and subthemes in each (Patton, 2002). Further analysis of the themes and subthemes led to identification of major recurring elements and the development of a thematic coding system. The transcriptions were reviewed a second time and the coding system was applied to identify relevant quotes and facilitate their organization into specific categories. Prior to incorporation in this thesis, the audio recording segments of these representative quotes were reviewed a second and third time to ensure the accuracy of direct quotations.

Australian Case Study

Following the collection and preliminary analysis of data from domestic case studies, this research was expanded to examine similar efforts at public gardens in eastern and southern Australia. These specific areas were selected because many of the larger cities therein exhibit developmental patterns similar to those of the U.S. and are struggling to satisfy growing demand in the face of increasingly scarce water resources. The objective of this case study was to investigate what educational outreach strategies Australian public gardens have undertaken to promote water-wise landscaping, and compare them with the findings from the domestic case study sites.

In total, 13 Australian organizations were engaged during the course of this research. Owing to time constraints however, each was studied less intensively than those of the domestic case study sites and they have been incorporated into the research as one aggregate case study. There were some differences in the research protocols between the domestic case studies and the Australian case study. First, the Australian investigation focused more on direct observation and staff interviews at each of the participating gardens, whereas contact with external allies was limited to representatives of national organizations. Second, the overall data collection process was streamlined to enable an accurate account of the elements present while minimizing the need for more intensive qualitative interviews. This was accomplished through the application of the merged findings matrix developed during the cross-case analysis of the domestic case study sites. This comprehensive listing served as a checklist that the researcher could annotate to reflect the various strategies to promote

water-wise landscaping observed at each of the gardens visited. Interviews with garden staff and representatives of their collaborative allies augmented this direct observation by providing clarification and additional detail about the evolution and logistics of these strategies to promote water-wise landscaping. These interviews were informal and conversational to increase the relevance to the specific circumstances and perspective of each participant (Patton, 2002). Hand notes were recorded during the interviews to capture the essence of the conversation, and specific details were subsequently obtained from participants through follow up emails. The organizations consulted for the Australian case study were:

1. Brisbane Botanic Gardens, Mount Coot-tha, Queensland
2. Cairns Botanical Gardens, Cairns, Queensland
3. Nursery & Garden Industry Australia
4. Royal Botanic Gardens Adelaide, South Australia - Adelaide Botanic Garden
5. Royal Botanic Gardens Cranbourne, Victoria - Australia Garden
6. Royal Botanic Gardens Melbourne, Victoria
7. Royal Botanic Gardens Sydney, New South Wales
8. Royal Botanic Gardens Sydney, New South Wales - Mount Annan
9. Smart Approved WaterMark Corporation
10. Sustainable Gardening Association
11. Sustainable Landscapes Project
12. Waite Arboretum, Adelaide, South Australia
13. Werribee Open-range Zoo, Geelong, Victoria

Individual Level

A visitor survey was conducted to better understand the specific needs and preferences of the public with respect to water-wise landscaping. The survey (Appendix J) was constructed using Dillman's tailored design method (Dillman, 2009). Closed-ended questions with multiple and mutually exclusive categories were used to obtain demographic information about respondents, whereas unipolar ordinal scale questions were used to elicit opinions and preferences about water-wise landscaping information and exhibits. Prior to their use, the research protocol and survey questions were approved for exemption of full Human Subject Review Board review by the Director of Compliance in the Research Office at the University of Delaware (Appendix K).

The visitor survey was piloted at the Water Conservation Garden in El Cajon, California on March 28 and 29, 2009. During this time, all visitors were greeted at the front gate and asked to complete a short questionnaire before entering the garden. Participants were informed that the survey was part of a study about public gardens' role in promoting water-wise landscaping and that their responses would be anonymous. These same visitors were then asked to provide some feedback about their visit through an online survey and were given a business card with a web address directing them to the appropriate Qualtrics™ website.

A second visitor survey was administered in conjunction with the garden's semi-annual Water Smart Gardening Festival on November 14 and 15, 2009. Owing to the high volume of traffic during this event, not all visitors could be engaged but every effort was made to select participants at random. Participants were informed about the

nature of the research and were asked to complete a paper survey upon the conclusion of their visit. The responses from the second visitor survey were later entered into Qualtrics™ and merged with those from the pilot survey. This combined dataset was then exported to a spreadsheet and analyzed using JMP 8.0 software (JMP, 2010).

In total, 127 visitors participated in this survey. The demographics of these participants are presented in Appendix L of this thesis. It should be noted that the sample was relatively small and localized. There was also the potential for respondent bias with respect to preferred modes of communication as all of the participants had already decided to seek out the demonstrations gardens and displays at the Water Conservation Garden. The researcher took these limitations into account when analyzing the data. Although the insights gained from this survey were valuable, the responses of these visitors may not accurately represent the preferences of the entire population of the San Diego metropolitan area much less the residents of a different region.

Chapter 4

RESULTS

Institutional Survey

The Importance of Practicing Water Conservation

When asked to rank the importance of practicing water conservation in their institution's operations, including its landscapes and facilities, 44.9% of the 127 APGA survey respondents chose "Very Important," 37.8% said "Moderately Important," and 17.3% relied "Slightly Important," or "Not Important." The locations of institutions were then used to compare the distribution of these responses across geographic regions as depicted in Figure 4.1.

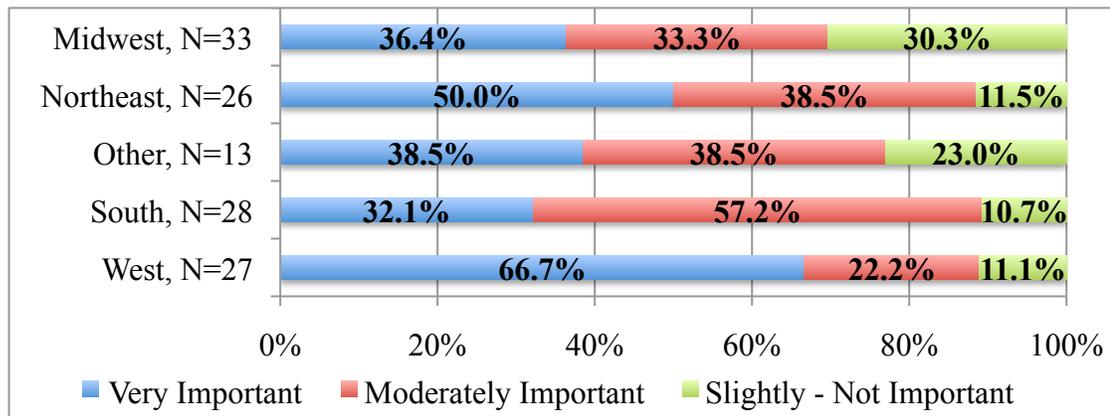


Figure 4.1 Regional Importance of Practicing Water Conservation Amongst Institutions Responding to American Public Gardens Association Survey (N=127)

The Importance of Public Education about Water Conservation

Similarly, survey participants were asked to rank the importance of public education about water conservation and water-wise landscaping relative to other facets of their institution’s mission. Out of 125 responses to this question, 30.4% said that such educational outreach was “Very Important,” 33.6% classified it as “Moderately Important,” and 36% replied “Slightly Important,” or “Not Important.” The location of responding institutions were then used to compare the geographic distribution of responses within each of these three categories as depicted in Figure 4.2.

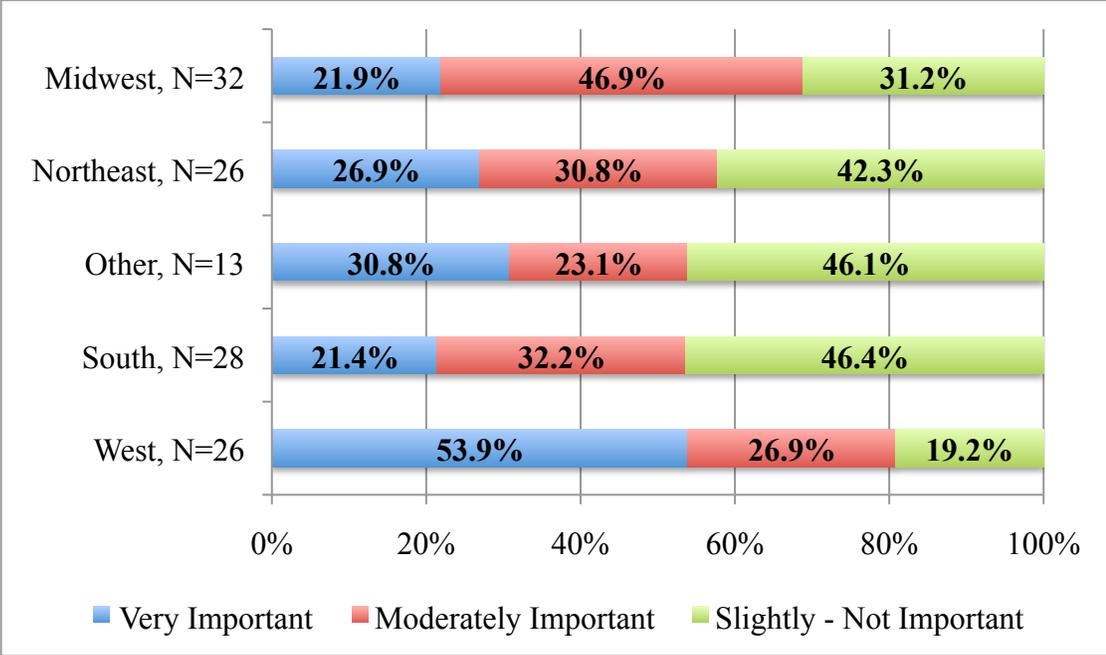


Figure 4.2 Regional Importance of Public Education about Water Conservation & Water-Wise Landscaping Amongst Institutions Responding to American Public Gardens Association Survey (N=125)

Collaborations with External Allies to Promote Water-wise Landscaping

APGA survey participants were also asked to describe the status of their institution’s collaborations with various external allies to promote water-wise landscaping, as represented in Figure 4.3.

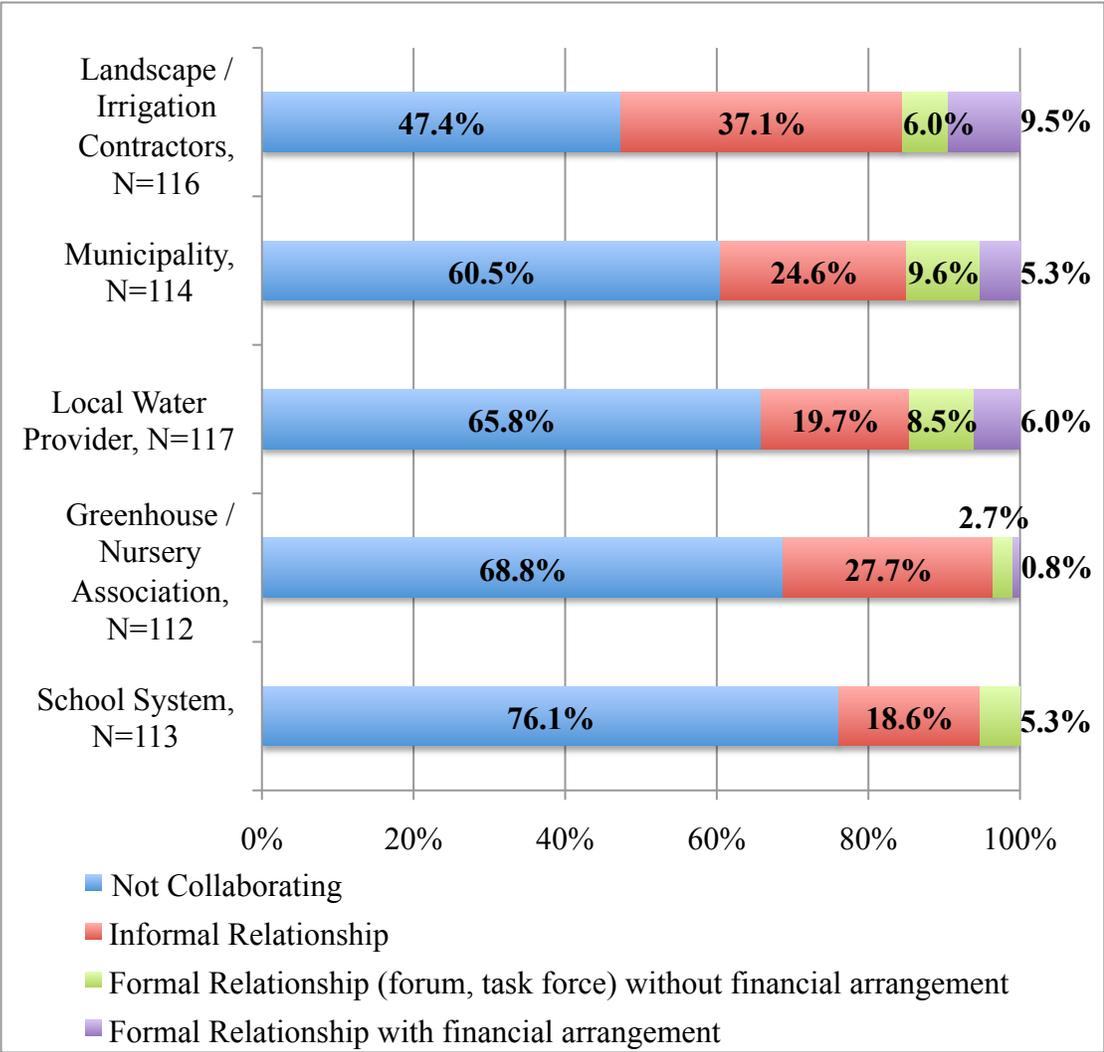


Figure 4.3 Proportion of Responding Institutions in American Public Gardens Association Survey Collaborating with Various External Allies to Promote Water-wise Landscaping (N= 112 to 117)

Internal Efforts to Promote Water-wise Landscaping

Providing Water-wise Landscaping Information or Resources

When asked whether or not their institution provided information or resources to the general public about water-wise landscaping, 74 (58.3%) of respondents said, “Yes,” while 45 (35.4%) said “No.” Of the 127 survey participants, 8 respondents (6.3%) did not answer this particular question. The geographic distribution of these responses by region is depicted in Figure 4.4.

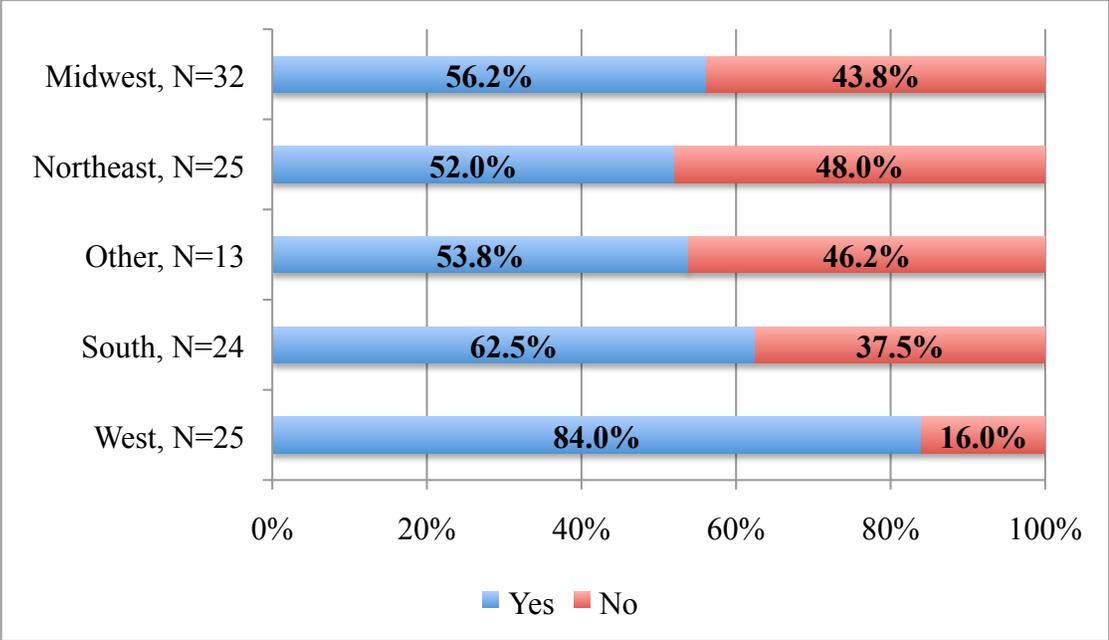


Figure 4.4 Regional Distribution of Institutions in American Public Gardens Association Survey Providing Information or Resources to the General Public about Water-wise Landscaping (N=119)

Water-wise Landscaping Content

The 74 respondents, who indicated that they were providing information and resources to the general public about water-wise landscaping, were then asked to describe the types of content being provided. The responses to this question are presented in Figure 4.5.

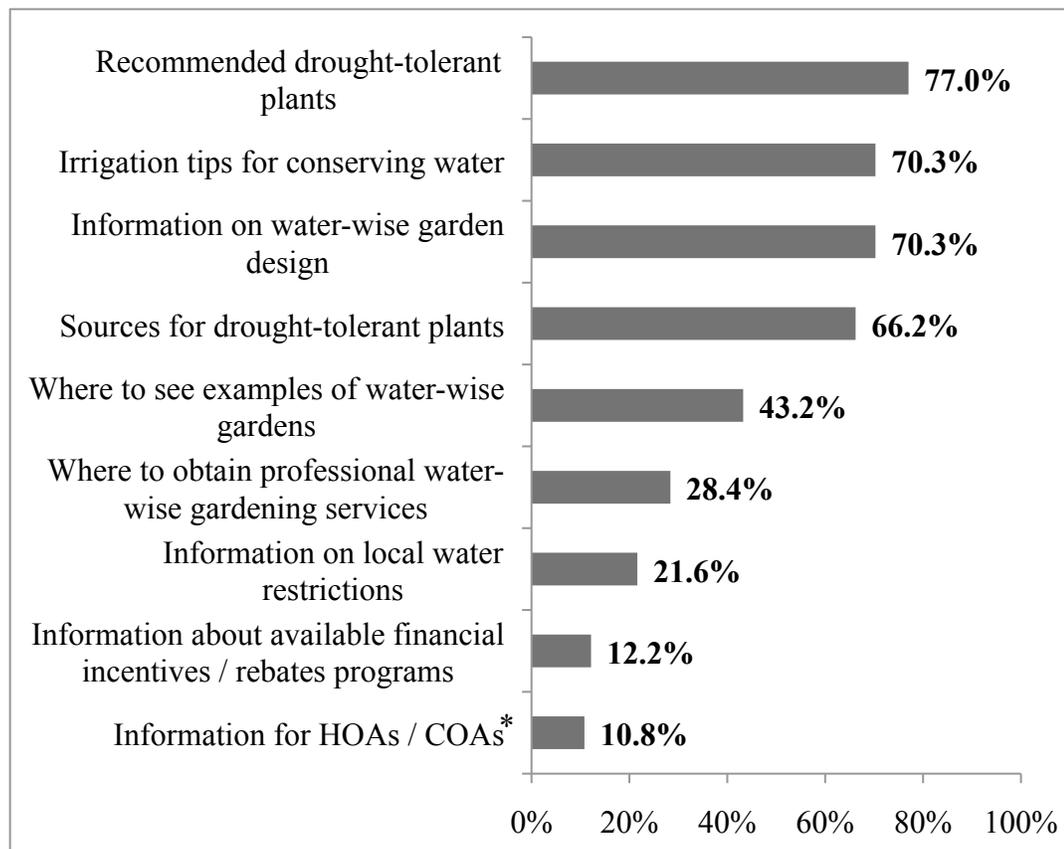


Figure 4.5 Proportion of Institutions in American Public Gardens Association Survey Providing Various Types of Information About Water-wise Landscaping (N=74)

* HOA = homeowner association, COA = condominium association

Strategies for Communicating about Water-wise Landscaping

These same 74 respondents were asked to describe which vehicles their institution used to provide information about water-wise landscaping. Their responses are presented in Figure 4.6.

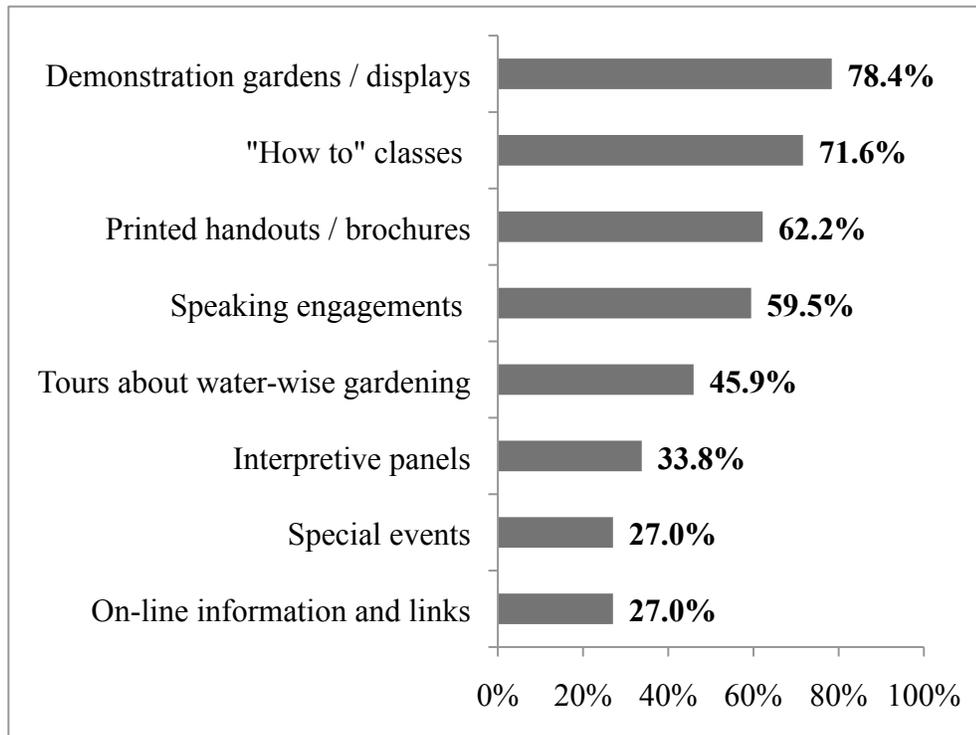


Figure 4.6 Proportion of Institutions in American Public Gardens Association Survey Using Various Vehicles to Provide Information About Water-wise Landscaping (N=74)

Evaluation

Formative Evaluation

Of the 74 respondents indicating that their institutions were providing information and / or resources to the general public about water-wise landscaping, only 29.4% indicated that they used some form of needs assessment to determine what type(s) of content to provide. Most of these were described as part of a visitor survey, strategic planning process, or staff meeting discussions. A similar proportion, 29.3%, indicated that their institution had undertaken a needs assessment to determine which vehicles to employ to engage the public about this issue.

Summative Evaluation

When these 74 respondents were asked if their institution had conducted any evaluation on its efforts to promote water-wise landscaping, 59.5% replied “No,” while 28.4% indicated that they had conducted program participant evaluations, and 16.2% reported having administered visitor surveys.

Case Studies

Case Study Summaries

Denver, Colorado

Public Garden

The Denver Botanic Gardens (DBG) was chartered as an agency of the City of Denver in 1951 and development of the Garden's primary site on York Street commenced in 1959. Today, the institution also encompasses Chatfield and Mount Goliath, two other sites in the Denver Metropolitan Area and is run as an independent non-profit foundation and is governed by a board of trustees. The Denver Botanic Gardens has an annual operating budget of approximately 10.5 million dollars and between the three sites, serves over 600,000 visitors each year (Kelaidis, 2009).

Denver Botanic Gardens has always been on the front line of sustainability issues by promoting native species, integrated pest management, water conservation and other sustainable gardening practices. The Garden's mission is, "to connect people with plants, especially plants from the Rocky Mountain region and similar regions around the world, providing delight and enlightenment to everyone" (Denver Botanic Gardens, 2010). As part of this effort, DBG has hosted several water conservation demonstration gardens at its York Street site including its current Roads Water-Smart Garden, which features a number of very attractive drought-tolerant species and some interpretive signage. Over the years, DBG has partnered sporadically with Denver Water to work on water conservation issues and is currently collaborating

on the PlantTalk™ and Plant Select® programs with Colorado State University Cooperative Extension and Green Industries of Colorado. In addition to seeing Plant Select® introductions in the landscape at DBG, visitors can also pick up brochures with more information about the program and the plants themselves.

Water Utility

Denver Water's conservation department coined the term "xeriscape" in the late 1970s and, about the same time, developed a demonstration garden around its administrative headquarters. In the mid-1980's, Denver Water founded the non-profit organization Xeriscape Colorado, which is now part of Colorado WaterWise and works, "to promote water wise practices among homeowners, businesses, and water providers" (Colorado WaterWise, 2009). Denver Water also partnered with the Bureau of Land Reclamation in YARDX, a 1997-2002 study to estimate the water savings of xeriscaping across seven municipalities in the Denver metropolitan area (Medina, 2004). Over the years Denver Water has partnered with the DBG to develop two different demonstration gardens on its York Street site. In addition, Denver Water worked with staff to develop the content of the *Xeriscape Plant Guide*, and financed its publication as the first of a three-book series published by Fulcrum Press (Gardener, 2009). Denver Water used to hold a series of xeriscape seminars at the gardens and staffed a xeriscape booth at the DBG annual Mother's Day plant sale but terminated these activities because they believed they were no longer reaching enough new people to justify the costs (Gardener, 2009).

Cooperative Extension

Colorado State University Cooperative Extension hosts PlantTalk™ and Plant Select®, two collaborative ventures co-sponsored by DBG and Green Industries of Colorado. Both projects were undertaken to deliver unified messaging and resources to the public. PlantTalk™ provides horticultural advice on a wide variety of topics, including water considerations and xeriscape, through its brochures and a series of audio scripts made available online (PlantTalk, 2010). Plant Select® was established to “seek out, identify and distribute the very best plants for landscapes and gardens from the intermountain region to the high plains” (Plant Select, 2010). While drought-tolerance is not the only criteria in this evaluation, it has a significant role in determining which plants are suitable for the program (Klett, 2009). Plant Select® has developed a brand and produces marketing material for taxa that meet its evaluation criteria and, in exchange, receives some royalties from their sales (Klett, 2009).

Plant Select® conducts much of its work through a conglomerate of 65-70 demonstration gardens, nursery and greenhouse growers, and garden center retailers throughout Colorado (Klett, 2009). Potential growers and demonstration gardens must formally apply and be approved for membership, which is subject to periodic review to ensure high and consistent Plant Select® standards. The retail members of Plant Select® receive marketing materials, such as signs and brochures in exchange for a \$100 annual fee (Klett, 2009). The retail members also provide semi-annual reports on Plant Select® sales so that the organization can keep track of the number of each taxa sold and the royalties due (Klett, 2009).

Plant Select® began as a memorandum of understanding between Colorado State University Cooperative Extension and Denver Botanic Gardens. In 2006, the organization attained independent 501(c) 3 status, hired its own executive director and sought out more active involvement by the green industry (Klett, 2009). At present, DBG, Colorado State University Cooperative Extension and the Green Industries of Colorado each have two positions on the Plant Select® Board of Trustees. The change has also meant a formalization of the way that Plant Select® does business as evidenced by the fact that both Denver Botanic Gardens and Colorado State University must now submit funding proposals to Plant Select® for plant exploration and research (Klett, 2009).

Plant Select® hosts an annual members' meeting to discuss current plant evaluations and offer a variety of professional development activities. The event also serves as an important venue for Plant Select® to roll out new marketing campaign materials (Klett, 2009). Plant Select® also maintains a blog and holds a regular session at ProGreen, the region's annual trade conference, in which it unveils its new plants.

Green Industry

The Green Industries of Colorado (GreenCO) is an umbrella trade organization comprised of the following groups:

- Associated Landscape Contractors of Colorado
- Colorado Chapter of the American Society of Landscape Architects
- Colorado Association of Lawn Care Professionals

- Colorado Nursery and Greenhouse Association
- Garden Centers of Colorado
- International Society of Arboriculture/Rocky Mountain Chapter
- Rocky Mountain Chapter/Golf Course Superintendents Association of America
- Rocky Mountain Sod Growers Association

In 1996, GreenCO began working with Colorado State University, the Colorado WaterWise Council, Denver Water and the Colorado Water Resources Research Institute to respond to challenges posed to the industry by potential water shortages related to either population growth or drought (Green Industries of Colorado, 2008). The result was the development of a best management practices manual in which, “xeriscape and water budgeting provide the foundation” for green industries to address sustainability issues (Green Industries of Colorado, 2008). In addition to providing specific water-conservation guidelines for green industry professionals, this manual repeatedly refers practitioners to the Denver Botanic Gardens, Colorado State University Cooperative Extension, and Plant Select® for further resources. In 2004, GreenCO also partnered with Homebuilders Association of Metro Denver to produce a report on how these two industries could work more effectively in support of public outreach and education for landscape water conservation in new homes and developments (Wright Water Engineers, 2004).

San Diego, California

Public Garden

Planning for the Water Conservation Garden in El Cajon, California began in 1989 when neighboring Cuyamaca College provided the nearly 5-acre site, and the nearby Helix and Otay water districts contributed substantially to the initial capital campaign (Eberhardt, 2009). The Garden opened to the public ten years later in 1999 and was charged by the founding partners with, "Promoting water conservation in the southern California landscape through excellent exhibits and programs that educate and inspire the public" (Eberhardt, 2007). Today, the Water Conservation Garden has an annual operating budget of over \$700,000 and serves over 50,000 visitors each year (Eberhardt, 2009).

Executive Director Marty Eberhardt still sees education about water conservation and water-wise landscaping to be, "the very reason for [the Garden's] existence" (Eberhardt, 2009). Accordingly, the Garden has dedicated most of its space to addressing the importance of water conservation and water-wise landscaping. These exhibits feature extensive interpretive signage and run the gamut from telling the story of the California water cycle and explaining the "seven principles of xeriscaping," to showcasing demonstration gardens of drought-tolerant plants, lawn alternatives, and hands-on irrigation displays.

In concert with the physical exhibits, the Water Conservation Garden provides a suite of programmatic offerings related to water-wise landscaping such as classes that teach participants how to convert their gardens to more water-wise design.

Garden staff also provides tours to grounds department workers from various city and county parks interested in incorporating these principles into their landscape installation and maintenance (Eberhardt, 2009). In addition, the garden hosts a semi-annual Water Smart Gardening Festival, featuring exhibitors from local water utilities, nurseries, and landscape professionals. One of the most popular aspects of this event, which brings hundreds of visitors to the site, is the opportunity to sit down and get free landscape advice from garden designers.

The Water Conservation Garden also provides the public with a wide variety of water-wise landscaping resources. Garden visitors can pick up attractive brochures containing drought-tolerant plant recommendations and information about locally available financial incentive programs. Recently, the garden has also started offering the “Water Smart Pipeline,” a telephone-based service where people can get gardening advice. In its first year, over 80% of the inquiries made through this service pertained to water-wise landscaping (Sterman, 2009).

The positive impact that the Water Conservation Garden has had on local adoption of water-wise landscaping practices is evident in Otay Water District’s annual Customer Opinion and Awareness Survey. Their 2008 survey indicated that 44% of Otay’s customers were aware of the garden, and 22% had visited. Of these respondents, over half had taken a formal tour and 17% had taken classes offered by the garden. Almost one-half (48%) of those who visited the garden reported having made changes to their landscaping as a result of their visit (Rea and Parker, 2008). The Water Conservation Garden has also served as a model for the development of similar institutions in other parts of the country. Deneen, Powell, Atellier, who served as the

original landscape architects, were later involved in the designing of Springs Preserve in Las Vegas, Nevada and the Conservation Garden Park at Jordan Valley in Utah (Eberhardt, 2009).

Since its inception, the Water Conservation Garden's has been governed by a Joint Powers Authority (JPA) with the San Diego County Water Authority serving as the lead agency along with Helix, Otay, Sweetwater, and City of San Diego water districts. Each of these agencies has a representative on the board of the JPA and collectively, they contribute more than half of the Garden's annual operating budget (Eberhardt, 2009). This structure has had both benefits and drawbacks but the general perception is that the institution has outgrown the JPA model and might benefit from greater autonomy. The Water Conservation Garden has begun a gradual move towards an independent Board, more typical of public gardens; however, the financial implications are not fully understood (Eberhardt, 2009).

Water Utility

In 2002, the San Diego County Water Authority (SDCWA) created a Conservation Action Committee (CAC) to bring together stakeholders from business, industry, and planning agencies to, "to obtain support for ideas in water conservation and to promote public awareness through communication" (San Diego County Water Authority, 2007). Following a regional Water Conservation Summit in 2006, the role of the CAC was increased to include overseeing three working groups covering Model Ordinance, Industry, and Outreach and Education (San Diego County Water Authority, 2007).

Since that time, the main committee of the CAC has met monthly and the working groups meet as needed (Roy, 2009). These meetings have provided an open forum where both public and private parties can bring ideas or concerns to the table and work in harmony to develop and promote water conservation initiatives. Some examples of these collaborations include the “Nifty 50” drought-tolerant plant list, California-Friendly® Landscape Contests, landscape conversion rebate programs and a “How-to” guide on water-wise landscaping for homeowner associations (Michelon, 2009). The CAC has also provided a venue for the SDCWA to work with real estate developers to establish water-wise landscaping standards for new construction projects. The Water Conservation Garden has maintained a prominent role within the Outreach and Education working group of the CAC and has helped in both the content development and role out of various initiatives (Michelon, 2009).

In recent years, SDCWA has worked to duplicate some of the landscape water conservation resources offered at the Water Conservation Garden in the northern part of the county at the San Diego Botanic Garden (formerly Quail Botanic Garden). In addition, SDCWA is looking for ways to establish “mannequin” gardens throughout different parts of the county that would demonstrate water-wise design in the context of residential landscape. The model under consideration would entail financial incentives and contractual arrangements with residents willing to convert and maintain their landscape in accordance with SDCWA standards (Granger, 2009).

Cooperative Extension

Despite making appearances at the some of the Water Smart Gardening Festivals, Cooperative Extension has not taken a very active role in the area's campaign to promote water-wise landscaping. Garden consultant and landscape designer Nan Sterman suggested that this may be a product of the local chapter's decision to focus its efforts on more conventional aspects of gardening (Sterman, 2009). That said, the local cooperative extension office does provide some water conservation content on its website but it mostly limited to links to other organizations' programs such as the regional "Be Water Wise" campaign, SDCWA's "20 Gallon Challenge," and the California Irrigation Management Information System (University of California Cooperative Extension, 2010).

On a statewide level however, researchers from the University of California Cooperative Extension have partnered with staff at the UC Davis Arboretum and California Center for Urban Horticulture to work with the green industry to identify and promote landscaping plants well suited to the region (Reid and Oki, 2008). Called the UC Davis Arboretum "All-Stars", this program began conducting irrigation trials on a campus field site in 2005. Since then, it has replicated these trials at 14 demonstration gardens in different parts of the state including the Water Conservation Garden in El Cajon and, with the help of Master Gardeners, conducts monthly evaluation on plant performance in their respective climate zones (California Center for Urban Horticulture, 2010).

Green Industry

Perhaps the most prominent manifestation of the green industry's involvement in the promotion of water-wise landscaping is that of the San Diego chapter of the California Landscape Contractors Association (CLCA). This group has worked steadily within the industry working group of SDCWA's Conservation Action Committee for years (Roy, 2009). They offer the public specific recommendations about how to cope with drought conditions and have encouraged their 250 members to enroll in their Water Management Certification Program that, "Provides the training and experience needed for contractors to assist consumers in saving water" (California Landscape Contractors Association, 2010). The local chapter of the Irrigation Association and other green industry groups are also actively supporting this area's water conservation campaign (San Diego County Water Authority, 2010).

San Antonio, Texas

Public Garden

Formal planning for the San Antonio Botanical Garden began in the late 1960s and site development commenced in 1976. The facility is owned and operated by the City of San Antonio's Parks and Recreation Department. In 1980, the San Antonio Botanical Society was established as an independent 501(c) 3 to support the garden. The mission of the San Antonio Botanical Garden is, "to inspire people to connect with the plant world and understand the importance of plants in our lives" (San Antonio Botanical Garden, 2007). Now 33 acres in size, the San Antonio Botanical Garden has an annual operating budget of 2.8 million dollars and serves approximately 92,000 visitors each year (Kodet, 2009).

With respect to water-wise landscaping, the San Antonio Botanical Gardens hosts two demonstration gardens. The oldest, Watersaver Garden, was started in the mid 1990's and focuses on the seven principles of xeriscaping. Each of the seven "stations" provides interpretive signage about one of the principles accompanied by mature specimens of drought-tolerant garden plants. The second demonstration garden, Watersaver Lane, was established a few years later and consists of a series of miniature houses, each in a distinct architectural style and landscape aesthetic using water-wise plants. Both demonstration gardens were created with financial assistance from the San Antonio Water System (SAWS), which continues to provide support for signage and associated maintenance (Peterson, 2009). The inspiration for the Watersaver Lane was to provide examples of the versatility of water-saving

landscapes in a residential context so that visitors could relate it to their own gardens (Guz, 2009).

The garden offers bi-weekly guided tours of these demonstration gardens during which participants receive a free copy of the SAWS publication, *San Antonio Landscape Care Guide*. In addition, the San Antonio Botanical Garden promotes a list “Water Saving Mostly-Native Plants” on its website. Other programmatic offerings include hosting the SAWS Annual Garden Jazz Festival, an event that brings thousands of people to the site and consequently exposes them to the Watersaver demonstration gardens and exhibits (Guz, 2009).

Water Utility

According to former Conservation Director, Dr. Calvin Finch, SAWS was, “relatively slow to actively support water conservation,” but took on a more aggressive role beginning in the mid 1990s and eventually became the, “dominant force in the effort” (Finch, 2009). This claim is substantiated by the fact that SAWS was given the Rain Bird™ 2009 Intelligent Use of Water Award in the Public Sector Category, for its role as the financial engine behind several collaborations in a successful water conservation campaign (Rain Bird (c), 2009).

One of the first partnerships SAWS developed was a Seasonal Irrigation Program (SIP) Research and Education Program conducted with the help of the county extension service’s Master Gardeners. About this same time, SAWS realized the value of water-wise demonstration gardens and pursued an arrangement to develop one at the San Antonio Botanical Garden. To invigorate these relationships further,

SAWS introduced a Performance Contract Model in which its partners receive an annual administrative allocation and are reimbursed for educational events and programs on a per participant basis (Peterson, 2009). Calvin Finch also commented that, “the relationship between SAWS, the AgriLife Extension, Bexar County Master Gardener[s], and the Botanical Gardens, contributed greatly to the San Antonio [water] conservation success” (Finch, 2009). Recently, SAWS has also started working with members of the green industry to create a WaterSaver Landscape Specialist Program (Peterson, 2009).

The SAWS has also developed and is distributing some of its own water-wise resources. One example, their *San Antonio Landscape Care Guide*, is a colorful booklet organized by season that provides a water-wise landscaping overview and includes recommended drought-tolerant plants and tips on garden design and maintenance (San Antonio Water System, 2005). Another resource, a SIP kit, helps customers measure and record the amount of water emitted from their sprinkler system. These kits are distributed through Master Gardener outreach efforts and at some of SAWS’ special events. In addition, SAWS produces a weekly WaterSaver electronic newsletter that offers tips on garden design, maintenance, and irrigation with a concerted focus on helping readers reduce landscape water use. Subscriptions to this newsletter exceed 7,000 and are rising quickly and SAWS has already seen evidence that recipients use 11,000 gallons less per year than non-recipients of similar socio-economic status (Guz, 2009).

Cooperative Extension

As noted previously, the Texas AgriLife Extension Service, Bexar County Master Gardeners play a major role in water-wise landscaping education for the general public. They provide most of the bi-weekly tours of the demonstration gardens at the San Antonio Botanical Gardens, and strategically staff a free plant clinic on WaterSaver Lane, where they expose visitors to the water-wise landscaping message (Rogers, 2009). Recently, SAWS has formalized their relationship with the Master Gardeners through a paid liaison position. This individual attends alternate meetings of the SAWS Conservation Department to facilitate communication between the two entities and optimize opportunities for collaboration (Guz, 2009).

Another manner in which the Texas AgriLife Extension Service has influenced this region's landscaping with respect to water conservation is through its Texas Superstar® selection program and marketing campaign (Finch, 2009). Started in 1989, the Texas Superstar® program has introduced over 40 plants with an estimated financial impact of \$15 million dollars in combined sales. While drought-tolerance is not the only characteristic under evaluation it does fit within the criteria of a plant's ability to, "consistently perform well for Texas consumers regardless of their plant growing expertise" (Parsons, 2010).

Green Industry

A founding member of the Texas WaterWise Council, The Texas Nursery and Landscape Association (TNLA) has demonstrated its commitment to, “helping the citizens of Texas practice WaterWise gardening” (Texas Nursery and Landscape Association, 2010). In their publication, *The Best of Texas Landscape Guide*, TNLA provides a comprehensive introduction to the fundamentals of water-wise landscaping based on the seven principles of xeriscape and many recommendations for drought-tolerant plants. In addition, TNLA has worked with the Texas Superstar® program to help promote their latest selections through the association’s publications and Growers Expo (Texas Superstar, 2010).

Recently, the Green Industry Alliance, San Antonio Irrigation Association and the Texas Nursery and Landscape Association, partnered with SAWS to created the WaterSaver Landscape Specialist Program. The program was conceived as a way to integrate the expertise from each of these disciplines under the banner of water conservation (Peterson, 2009). Participants in the program must attend a two-day workshop and commit to sending a percentage of their employees to a series of half-day sessions. In exchange, they receive recognition and promotion through SAWS as a certified specialist while also earning Continuing Education Credits in their respective professional organizations (Peterson, 2009).

Chapel Hill, North Carolina

Public Garden

The North Carolina Botanical Garden (NCBG) was started with the dedication of 70 acres of forested land by the state in 1952. The garden was operated as part of the University of North Carolina at Chapel Hill's Botany and later Biology Departments but now functions as a non-academic public service outreach agency of the University (Ward, 2009). Today the garden manages over 1000 acres of land including the Coker Arboretum and natural areas such as the Mason Farm Biological Reserve and Battle Park (North Carolina Botanical Garden, 2010). The garden receives about 45,000 visitors each year at its primary site and has an annual operating budget of nearly 1.3 million dollars, half of which comes from the state (White, 2009).

The NCBG's mission is "To inspire appreciation, and conservation of plants in gardens and natural areas and to advance a sustainable relationship between people and nature." Over the years, the garden has taken this leadership role to heart, as evidenced by its work in plant conservation, natural area protection and efforts to pioneer the *Voluntary Codes of Conduct for Botanic Gardens and Arboreta* on invasive species (North Carolina Botanical Garden, 2010).

The NCBG also aspires to model sustainable landscape practices in all of its displays and offers the public a variety of gardening classes, all of which incorporate elements of environmentally friendly gardening. The institution's philosophy in doing so could be condensed to, "Right plant, right place," (Ward, 2009). While it does not have a water-wise demonstration garden per se, it is an

important part of that message that gets emphasized during droughts. An example would be their development of a “Gardening for Drought” brochure and webpage content in response to the area’s 2007-08 water shortages (Ward, 2009).

Water Utility

The Orange County Water and Sewer Authority (OWASA) identified partnerships to be, “key to the success of our local conservation program,” in their Report on Collaborative Water Conservation Strategies for Joint Consideration by Carrboro, Chapel Hill, Orange County, and OWASA. In this report, both the Cooperative Extension and the University were specifically listed in their list of potential public sector partners, along with home and building contractors and the landscaping/irrigation industry in the private sector category (Orange County Water and Sewer Authority, 2008). OWASA has already collaborated with the Cooperative Extension, green industry, and botanical garden to provide a series of sustainable landscaping workshops that featured considerable of content on water-wise landscaping (Orange County Water and Sewer Authority, 2009). Currently, OWASA is pursuing ways to host these workshops at the botanical garden in the future and secure funding support for demonstration gardens and exhibits there too (Davis, 2009).

Cooperative Extension

In addition to the aforementioned sustainable gardening workshops, the North Carolina Cooperative Extension Service (NCCES) has developed several resources about water-wise landscaping over the years. They have made most of this content, including extensive lists of drought-tolerant plants and tips on water-wise

garden design and maintenance available through their website (North Carolina Cooperative Extension Service, 2008). In addition, they have recently worked with the green industry to produce two brochures about water-wise gardening and effective watering tips (North Carolina Green Industry Council, 2008).

Green Industry

Another emerging stakeholder in this region is the North Carolina Green Industry Council (NCGIC). This umbrella organization represents over 2,500 firms throughout the state via their professional associations with organizations like:

- North Carolina Nursery and Landscape Association
- Turfgrass Council of North Carolina
- North Carolina Christmas Tree Association
- North Carolina Commercial Flower Growers Association
- Carolinas Irrigation Association
- North Carolina Sod Producers Association
- Carolina Grounds Management Association
- Central North Carolina Nursery Association
- North Carolina Pine Needle Producers Association
- Charlotte Arborists Association
- NC Composting Council, Inc.

During the severe drought of 2001-02, NCGIC formed a Drought Task Force to work with local water providers on drought ordinances. Although early

efforts were fraught with conflict, NCGIC came to realize that a paradigm shift was needed for them to become a part of the solution, and began focusing on bringing alternatives to the table (Chapman, 2009). Since then, NCGIC has worked with water providers and politicians to craft policy focused on long-term water management rather than reactive restrictions that can hurt the industry (Chapman, 2009).

Recently, the NCGIC has been very successful in securing support from the North Carolina Department of Agriculture & Consumer Services for marketing and research. One example of this collaboration has been a “Water-Wise Works!” media campaign focused on educating the public about the importance of practicing water-wise landscaping (Chapman, 2009). The campaign started with radio and television public service announcements and later added some high profile billboards. Another product of the Water-Wise Works! campaign has been the development of two brochures focused on water-saving landscaping and tips for efficient irrigation (Chapman, 2009). Support for these publications was obtained from the NC Golden Leaf Foundation, NCGIC, the NCCES, the NC Department of Agriculture and Consumer Services, and the NC Nursery and Landscape Association (North Carolina Green Industry Council, 2008). The NCGIC has engaged local water providers in the distribution of these two brochures, which now totals more than 500,000 copies combined (Chapman, 2009). The NCGIC also used their legislative funds to procure several weather-based “smart” irrigation controllers for use in the state’s public gardens. Their aspiration is for these controllers to be accompanied by some interpretive materials to educate visitors about how effective and accessible this technology is to adopt (Chapman, 2009).

Australia

Public Gardens

Nine public gardens throughout Australia were visited and included in this research. A short description of each institution and its efforts with respect to water conservation are presented in the following sections.

1. Brisbane Botanic Gardens, Mount Coot-tha, Queensland

Located just west of the city of Brisbane in Queensland, Mount Coot-tha began contending with water conservation in earnest when the area experienced a prolonged drought in 2005 and the garden was cut off from the municipal water supply. Since that time they have developed alternative sources of water and have worked to achieve greater efficiency in the irrigation of their collections (McGlenn, 2010). In addition to their internal efforts, the garden is considering the development of interpretive signage that addresses the need to practice water-wise landscaping (MacManus, 2010).

2. Cairns Botanical Gardens, Cairns, Queensland

Located in the wet tropics of northern Queensland, drought is not a chronic issue at the Cairns Botanical Gardens. However, the garden does work to reduce its own water consumption and is in the process of retrofitting their irrigation system to use recycled water. Over the years, they have set up some one-time exhibitions about water-wise gardening and have worked with the Cairns Regional Council to integrate water-wise design into a grading rubric of the council's annual garden contest (Warmington, 2010).

3. Royal Botanic Gardens Adelaide, South Australia - Adelaide Botanic Garden

The Adelaide Botanic Garden occupies approximately 41 acres in downtown Adelaide and has about 1.3 million visitors every year (Adelaide Botanic Garden, 2010). Amongst its many displays, the Adelaide Botanic Garden features a Mediterranean Garden, which showcases plants from other places around the world that share Adelaide's climate and can thrive in seasonally dry conditions. The garden incorporates limited interpretive signage about the adaptation of these plants and their potential for application in a sustainable landscape.

4. Royal Botanic Gardens Cranbourne, Victoria - Australia Garden

The Royal Botanic Gardens, Cranbourne is managed as part of the Royal Botanic Gardens Victoria and is located about an hour southeast of Melbourne. Amidst its 900 acres of natural heathlands, lies the recently established Australian Garden. In fact, at the time of this research the Australian Garden was entering its second stage of construction. This is one of the few gardens in Australia that requires an admission fee. Throughout the garden there is signage about the importance of water conservation and an exhibit about low water-use lawn alternatives. Among its many displays, the Australian Garden features a water saving garden that is divided into three terraces according to water-use and signage about ways to reduce landscape water use.

5. Royal Botanic Gardens Melbourne, Victoria

The Royal Botanic Gardens, Melbourne is the flagship of the Royal Botanic Gardens Victoria and occupies almost 90 acres in downtown Melbourne and

serves about 1.7 million visitors annually. The garden has been a long time leader in water conservation and established its xeriscape demonstration garden in 1992. This garden was renovated in 1999 with and was renamed the Water Conservation Garden (Royal Botanic Gardens Melbourne, 2010). In addition to the demonstration garden, the Royal Botanic Gardens, Melbourne also provides some water-wise landscaping advice for the public through its website and a brochure entitled, “Every Drop Counts.” Over the years, the garden has occasionally served as an experiential learning lab for professional water conservation certification classes offered by Irrigation Australia (Connellan, 2010).

6. Royal Botanic Gardens Sydney, New South Wales

First established in 1816, the Royal Botanic Gardens Sydney garden now occupies approximately 75 acres in downtown Sydney and is the flagship of the Botanic Gardens Trust. The garden is primarily focused on horticultural display and providing recreational green space for residents and, aside from limited signage about their internal efforts to conserve water, has not devoted many resources to educating the public about water-wise landscaping on the grounds. Recently however, the garden has partnered with Eden Gardens and Garden Center to provide a series of gardening workshops and lectures that incorporate sustainable practices (Hatherly, 2010).

7. Royal Botanic Gardens Sydney, New South Wales - Mount Annan Botanic Garden

Located in the western suburbs of Sydney, Mount Annan is operated as part of the Botanic Gardens Trust. Covering almost 1000 acres of land, this institution is exclusively dedicated to Australian native species in both its managed natural areas

and horticultural displays. Amongst the latter is the newly created “What’s the Big Idea Garden,” in which the displays and interpretive signage work in concert to provide an overview of sustainable landscaping practices including water-wise landscaping (Cole, 2010).

8. Waite Arboretum, Adelaide, South Australia

The Waite Arboretum occupies approximately 75 acres in the southern suburbs of Adelaide and is managed as part of the University of Adelaide. The garden was first established in 1928 with plantings of trees from all over the world but beginning in the late 1950’s and early 1960’s constrained its focus to Mediterranean regions with a climate similar to that of Adelaide. The garden now represents an extensive collection of mature specimens of drought-tolerant woody plants. Although the Arboretum has struggled to increase its visibility with the general public, it is being used regularly as an outdoor laboratory for plant identification courses in the Horticulture program at the nearby Urrbrae Campus of the TAFE vocational education school (Gardner, 2010).

9. Werribee Open-range Zoo, Geelong, Victoria

The Werribee Open-Range Zoo is managed as part of the Zoos Victoria and is located to the west of Melbourne in the suburb of Geelong. In 2006, the zoo began converting an old shearer’s house and surrounding yard into a water-saving demonstration garden. The garden opened to the public in 2008 featuring a combination of display beds and interpretive signage about water conservation set within the context of a residential landscape. The exhibit covers a variety of water-

wise topics including drought-tolerant plants, lawn alternatives, the use of mulch, and irrigation.

Water Utilities

Collaborations between public gardens and water utilities were found to vary across Australia. Despite being in the wet tropics of northern Queensland, Cairns Water has struggled to maintain enough storage capacity to meet demands during the dry season. As a result they are pursuing a dialog with the Cairns Botanical Gardens about funding a demonstration garden that could showcase a Queensland version of water-wise landscaping (Zesers, 2010). In South Australia and Victoria, where drought and water scarcity represent more regular and severe problems, the water utilities generally have more aggressive conservation campaigns and many have already developed ways to work with local gardens. For example, Adelaide's regional water provider, SA Water, funded the construction of the Mediterranean Garden at the Adelaide Botanic Garden (Sandham, 2010). Similarly, South East Water funded the water-saving exhibit at the Australian Garden in Cranbourne (Arnott, 2010). In Melbourne, South East Water funded the renovation of the water conservation garden at the Royal Botanic Gardens and continues to provide financial support for its maintenance (Symes, 2010).

Cooperative Extension

In the course of this study, the researcher did not find an exact Australian counterpart to the U.S. Cooperative Extension. However, two organizations were identified as filling a similar role in terms of public outreach:

1. Sustainable Gardening Association

The Sustainable Gardening Association (SGA) was started in 2002 with seed money from the Victorian government. Over the years it has extended its reach into other states and has evolved into a non-profit, non-governmental organization “dedicated to changing the way Australians garden” (Sustainable Gardening Association, 2010). The organization provides a wealth of gardening information to the public, including significant content on water-wise landscaping, through its website and e-magazine, neighborhood gardening groups, and workshops. The SGA has also developed a series environmental certification programs for landscapers, public gardens, and garden centers (Trigger, 2010). After passing certification, program participants pay annual dues to the SGA in exchange for promotion and resources.

2. Sustainable Landscapes Project

Housed at the Adelaide Botanic Garden, the Sustainable Landscapes Project was started in 2004 as a “collaborative partnership that demonstrates and promotes appropriate park and garden design, plant and material selections and sustainable horticultural practices for South Australian environments, including effective, efficient and appropriate water use” (Sustainable Landscapes Project, 2010). The other partners in this endeavor include local developers, land managers and the region’s water utility, SA Water. The organization has already identified a variety of qualified sites throughout Adelaide and South Australia and is working to extend their reach nationally (Pitman, 2010). In addition to promoting these sites as good

examples, the Sustainable Landscapes Project has been working to provide the public with resources through a series of brochures available on its website.

Green Industry

The following two industry organizations were also investigated for any role in the promotion of water-wise landscaping in Australia:

1. Nursery & Garden Industry Australia

The Nursery and Garden Industry Australia (NGIA) is funded through a plastic pot levy, the federal government, and dues from its 1400+ members. The organization works to create, “a united and sustainable industry providing plants, gardens and landscapes that are highly valued by Australian households and communities” (Nursery and Garden Industry Australia (a), 2010). In 2006, the organization launched a “Wise About Water” campaign to tell consumers that, “It is still OK to enjoy their garden; there are easy ways to use water responsibly while caring for their garden; and their local garden centre is the place to go to find this information” (Nursery and Garden Industry Australia (b), 2010). The campaign marked a turning point in which the industry realized the importance of positioning themselves as part of the solution and inspired a similar effort with regard to invasive species called “Grow Me Instead.” This campaign has been a major success because it benefits from national branding and mass media while still tailoring the content to specific regions through the involvement of NGIA’s state associations (Kachenko, 2010). NGIA would like to revitalize the “Wise About Water” campaign using a

similar model and explore ways to involve professional organizations like the Landscape Contractors Association (Kachenko, 2010).

2. Smart Approved WaterMark Corporation

Smart Approved WaterMark (SAWM) was established in 2004 by the following four organizations: Australian Water Association; Irrigation Australia; Nursery and Garden Industry, Australia; and Water Services Association of Australia. In 2006 the National Water Commission became financially involved in the project and, at present, SAWM also receives grant funding from Water Smart Australia through the Department of the Environment, Water, Heritage and the Arts (Smart Approved WaterMark, 2010). The long-term vision is for SAWM to become financially independent, funding the cost of its operations through its application and licensing fees.

SAWM was developed to complement the pre-existing and indoor-product-focused Water Efficiency Labeling and Standards scheme by covering services and organizations (Gray, 2010). The overarching vision for the organization is to boost consumer confidence by creating a brand known for its integrity. To do so, SAWM uses an independent Technical Experts Panel to assess an applicant's water savings before awarding it a quality mark (Gray, 2010). SAWM has already approved a number of gardening services and products as well as professional training programs and makes information about all these entities available to the public through the organization's website (Smart Approved WaterMark, 2010)

Cross-Case Analysis

Further data analysis led to the categorization of the different strategies to promote water-wise landscaping found at the case study sites and the construction of a comparative cross-case matrix (Table 4.1) in which, each strategy was ranked *high*, *moderate*, or *low* based on the degree to which it was observed at each site.

Table 4.1 Merged Finding Matrix Showing the Degree of Manifestation of Various Outreach Strategies in Campaigns to Promote Water-wise Landscaping Found at the Five Case Study Sites

H = High manifestation, M = Moderate manifestation, L = Low/No manifestation					
For example, under Collaborations with the local water utility, Denver was ranked <i>low</i> because at present there are no joint initiatives and few informal relationships between Denver Botanic Gardens and Denver Water. San Diego and San Antonio were classified as <i>high</i> because the public gardens there are actively engaged with their local water authorities through formal channels and have developed some financial arrangements to reinforce their collaborations. This relationship was classified as <i>moderate</i> in Chapel Hill because although the public garden and water authority have partnered in some educational outreach there is no formal mechanism for their collaborations and no ongoing financial relationship between them.					
Strategies	Denver	San Diego	San Antonio	Chapel Hill	Australia
Collaborations					
Water Utility	L	H	H	M	M
Green Industry	M	M	M	L	M
Cooperative Extension	H	L	H	M	L
Branding / Marketing					
Local / Regional	H	M	L	L	M
National	L	M	L	L	M

Table 4.1(cont.) Merged Finding Matrix Showing the Degree of Manifestation of Various Outreach Strategies in Campaigns to Promote Water-wise Landscaping Found at the Five Case Study Sites

Strategies	Denver	San Diego	San Antonio	Chapel Hill	Australia
Educational Outreach					
Brochures	M	M	M	M	M
Website	M	M	M	M	M
Water-wise newsletter	L	M	M	L	L
Water-wise hotline	L	M	L	L	L
Social networking technology	M	L	M	L	L
On-site tours / classes	L	H	H	L	L
Off-site classes / presentations	L	M	M	L	L
Special Events	L	H	H	L	L
Demonstration / Exhibits					
Drought-tolerant plants	M	H	M	L	M
Principles of Xeriscape™	L	H	H	L	L
Turf alternatives	L	H	M	L	L
Irrigation systems	L	H	M	L	L
Residential landscape models	L	M	H	L	L
H = High manifestation, M = Moderate manifestation, L = Low/No manifestation					

Case Study Interviews

Analysis of the interview transcripts yielded several themes and subthemes that were subsequently organized into four major categories: collaborations, marketing, actionable recommendations / resources, and evaluation. Representative quotes illuminating each of these themes and subthemes are presented in the following sections.

Collaborations

Several key informants consulted in this research noted the value of collaborations in a campaign to promote water-wise landscaping. As one individual commented, “How do we involve those who have the expertise in doing things that are mutually beneficial and take us farther than would otherwise be the case in the absence of that collaboration opportunity- that’s a guiding principle.” One theme that arose with respect to collaborations included strategic partnerships between public gardens, utilities, the green industry and cooperative extension. Another theme consisted of various elements deemed essential to building strong partnerships between these parties such as overcoming polarization, formalizing relationships and utilizing financial incentives.

Category: Collaborations	
Theme	<i>Representative Quotes</i>
Strategic Partners	
<i>Subthemes</i>	
<i>Public Gardens</i>	<ul style="list-style-type: none"> • “[The public garden has] excellent folks that know a lot about plants and give a real credibility to the effort.” (WA8) • “Our mission is ‘To connect people with plants, especially those of [this region] and similar climates’ which implicitly suggests water conservation as an important adjunct consequence.” (PG2) • “The local story, what’s going to work in one area isn’t going to work in another so that’s the benefit of having that network of gardens. They know what’s best for where they are. As an educator for homeowners, they are kind of one-stop shopping.” (IR1)
<i>Utilities</i>	<ul style="list-style-type: none"> • “What we experienced with [the water authority] is that they deal with customers and we deal with customers so there is a congruency there” (PG7) • “[The conservation department is] one of the smallest departments in [the water authority]...the only way we can do this is to work with these groups to leverage our ability to go out there and demonstrate the knowledge. It’s the only way we can do it.” (WA7) • “Well, to us that’s not just the water saved, it’s the energy you save. That’s [the electric utility] and we would hope they would jump in and have something because its all interrelated... We’re going to try to change our focus. It will now become energy savings through water conservation because that embodies more of the complete package.” (IR2)

Category: Collaborations	
Theme	<i>Representative Quotes</i>
Strategic Partners	
<i>Subthemes</i>	
<i>Green Industry</i>	<ul style="list-style-type: none"> • “We’re actually providing a whole palate of plants that will allow a lot of the industry to persist because now in a chronic drought our industry will dry up and blow away.” (PG2) • “When they say you can only water one day a week or you can’t water the public all of a sudden, they stopped going and buying plants. When they stop buying plants or demanding landscape services obviously it impacts everybody on down the line.” (IR2) • “Note that it’s really a collaborative role because much of the content was derived from industry representatives because we can’t presume to know everything that goes on with each of these markets.” (WA2) • “After the drought, when the water restrictions were so severe and the drought surcharges were just awful, the whole landscape industry realized that they needed to adapt or things were going to get really grim for them.” (WA1)
<i>Cooperative Extension</i>	<ul style="list-style-type: none"> • “We reach 10,000 people as [water utility] staff...but the master gardeners will reach over 50,000 on our behalf.” (WA3) • “I think the most important part of this diverse partnership, especially in the early days of the effort, was the relationship between SAWS and the Master Gardeners. The Master Gardeners carried the Conservation message to every population segment and neighborhood.” (WA8)

Category: Collaborations	
Theme	<i>Representative Quotes</i>
Building Strong Partnerships	
<i>Subthemes</i>	
<i>Overcoming Polarization</i>	<ul style="list-style-type: none"> • “For too long we saw the sprinkler industry as the enemy It’s the same way about the whole nursery industry...That ‘s the wrong thing to have done...its much more important for us to figure out ways that we can help them be part of the solution.” (PG4) • “Its patience on both sides ... The key is everybody’s got to get together. We’ve got appreciate their goals and they’ve got appreciate our goals and then we come up with a nice compromise.” (WA8) • “Anyway, it was contentions and we realized at that point that we weren’t going to get anywhere. We decided to back up and [adopt] a different perspective on how to approach municipalities and political leaders which was in terms of more partnering and bringing solutions to the table.” (IR2)
<i>Formalizing Relationships</i>	<ul style="list-style-type: none"> • “[An established network] did help us because as the drought is ramping up, these parties are already on board, poised to work together.” (WA4) • “[Ongoing relationships help] because you don’t have to recreate a program form scratch every eleven or 22 years when there is a drought.” (WA1) • “We don’t have strong enough partnerships, we don’t formalize them, we don’t’ have the periodic checks.” (WA6)
<i>Utilizing Financial Incentives</i>	<ul style="list-style-type: none"> • “I think the reason [our program] is working is that there’s money. Capitalism works and if you can come up with something that generates money it will inspire people to make things happen.” (PG2) • “We also reimburse the garden for x number of school tours. We have an agreement with them...they’re going to charge us x amount per tour ... We document it in our BMP reports, x number of students.” (WA5)

Marketing

Throughout the interviews, marketing was identified as an important aspect in any campaign to promote water-wise landscaping. Key informants spoke to various elements of an effective marketing campaign such as framing the issue in a positive manner, employing multiples modes of communication, engaging opinion leaders and normalizing the behavior.

Category: Marketing	
Themes	<i>Representative Quotes</i>
Using Positive Framing	<ul style="list-style-type: none"> • “First of all that word, xeriscape. You notice we keep using water saver – people keep picturing rocks and cactus and so we’ve [deemphasized it] because it just sounds too harsh so we’re using watersaver.” (WA3) • “When they understand that you are not really taking something away from them but you are actually delivering an enhancement. When they learn about the potentially carefree lifestyle that a more sustainable landscape can deliver...Our message is ‘You can have it, everything in moderation.’” (WA2)
Employing Multiple Modes of Communication	<ul style="list-style-type: none"> • “You’ve got to keep the momentum going and it’s got to change and become more interesting, more exciting. You can’t keep doing the same thing over and over. You’ve gotta use a new way to promote it, a new gimmick, a new gadget. It’s got to be at least as exciting as what’s enchanting people on the computer and on cable television.” (WA1) • It’s a totally different landscape...analyzing who you want to be talking to and what’s the best way to get that message across- whether your tweeting or your doing a PowerPoint slideshow in person.” (PG4)

Category: Marketing	
Themes	<i>Representative Quotes</i>
Engaging Opinion Leaders	<ul style="list-style-type: none"> • “When the HOA board is on board with those concepts that translates to all of the people who live in that community.” (WA4) • “Everybody can’t get here so, to the extent that we can, get the information out to others who can get those important conservation messages out wherever they are.” (PG4) • “Garden staff going out to speak to garden clubs and national and local [conferences], in one nucleus of spreading the word and permeating the community.” (PG3) • “That’s been a big cornerstone of our philosophy- it that’s its neighbor to neighbor- that’s the expression that we use...It’s this idea of neighbor-to-neighbor education.”(WA3)
Normalizing the Behavior	<ul style="list-style-type: none"> • “[Xeriscape] was just like the flavor of the month ... it’s fashionable when it’s dry it’s unfashionable when it’s wet. You have to move it out of the arena of fashion and into the arena of it becoming a part of the culture.” (PG2) • “There has always been this desire to have water-wise landscapes, more of them, out in the community ... People start seeing it in their neighborhoods. They start seeing it when they go the grocery store or to the gym or whatever and it starts becoming more of the norm.” (WA5) • “Some of our member agencies have started a [water-wise] garden contest which has grown over the years. We encouraged other member agencies to participate and now we have hundreds of entries every year.” (WA4) • “What the botanical garden could do is have a <u>your local garden here</u> certified water-wise garden program. You would apply and upon approval receive a sign or placard to put up in the yard.” (PG1)

Actionable Recommendations / Resources

As one interview subject noted, “If we can break it down into chunks that are actionable. Our end target is behavioral change - help them do things differently and still enjoy the full benefit, aesthetic qualities and functionality of a good landscape and potentially cut their outdoor water use in half.” Other key informants echoed these sentiments with comments that roughly fell into two major groups namely: *how to effectively model the desired behavior* and *how to increase the value of informational content and resources*.

Modeling the desired behavior was touted by most individuals consulted in this research with one individual remarking, “You have to have demonstrations of it...I hope that our garden or any garden has enough space that you can say, ‘Now here is an example that we should all aspire to, what we and everyone else needs to do and what were not doing enough of.’” Several other key informants noted that in order to be effective such demonstration gardens needed to be relevant to the general public’s typical application in a residential setting.

Category: Actionable Recommendations / Resources	
Theme	<i>Representative Quotes</i>
Modeling the Desired Behavior	<ul style="list-style-type: none"> • “Public demonstration gardens that just show huge varieties of plants don’t appeal to many customers. Visitors tell us they prefer to see how plants will look in a real landscape like their yards. Demo gardens look like patchwork quilts to newcomers; unattractive.” (WA1) • “You could look at the [typical demonstration garden] and say, ‘Well its nice that these plants are established so you’re seeing them at maturity...but at the same time, it’s hard to envision that look in your front yard unless you have a whole bunch of homes throughout the garden. So that’s been the talk, ‘Do you replicate mini front yards?’” (WA5) • “These little vignettes or little model landscapes that were the style of the home have helped a lot of visitors to the botanical garden see how they could take home and do something. It’s difficult to translate...it helps people who are not horticulturists are not master gardeners and yet now they can see it all pull together. I suppose an analogy would be, I can visit a furniture store and see a sea of couches and I can’t necessarily picture how that would pull together with everything else in my family room but show me a couple model rooms and I might be able to say ok I kind of like that one.” (WA3) • “[Our] whole grounds are laid out as a learning facility so if you look past the plants, you’ll find a lot of aspects as far as design and maintenance and not just a plant palate to walk home with.” (PG5) • “[I’d like to see] an exhibit on the different types of watering methods such as sprinkler, soaker, drip, needle, etc., that would also show how much water is used by each method. In conjunction with this, maybe some interpretive signage on how to water properly.” (PG6)

The other comments related to actionable recommendations and resources pertained more to the provision of water-wise landscaping information. Here, the recurring theme was the importance of tailoring content to the particular needs of a specific audience by their location and / or anticipated application.

Category: Actionable Recommendations / Resources	
Theme	<i>Representative Quotes</i>
Tailoring Content to Specific Audiences	<ul style="list-style-type: none"> • “We learned over time that it was better to try to focus the information to different audiences whether it was the homeowner, or it was developers that were going to build forty houses. What do they do in their operations to create a landscape that is more water-wise? So we had homeowner versus commercial types of information and try to get the audiences segregated so they were really getting the type of materials that would be of most use.” (PG4) • “The opportunity [of a regional campaign] brought some economies of scale but with so many parties involved, it was hard to ensure that the content was specific enough to serve the local community’s conditions and needs. We decided well let’s collaborate lets partner locally and have things that are more tailored to our region.”(WA6)

Evaluation

Although a couple of individuals consulted in this research commented on the perceived impact that their water-wise campaigns had on the landscaping habits of local residents, their evaluation was solely based on anecdotal evidence. While the value of formative needs assessments and empirical summative evaluation were widely acknowledged by key informants, most indicated that their organizations simply lacked the resources to conduct them.

Category: Evaluation	
Theme	<i>Representative Quotes</i>
Formative Evaluation	<ul style="list-style-type: none">• “I think that the real use of the metric would be ‘what are the best ways to deliver the message?’ We probably could learn as a staff from that, figure out better ways to fine-tune.” (PG3)• “We did a bunch of research. We did focus groups on public attitudes toward landscaping their gardens. We did gardeners, landscape contractors, prop managers, general public, big water users, and Hispanic water users. We did that in developing our outreach- a lot of research...the research was extensive and informed our approach.” (WA4)• “[Needs assessment] has really been done on an informal basis. We talk to people all the time and docents talk to people all the time on the ground and in classes. We have class evaluations so we get a pretty good sense of what people are looking for and needing. Our classes and events have been very much designed and changed over time to reflect what people say they want.” (PG7)

Category: Evaluation	
Theme	<i>Representative Quotes</i>
Summative Evaluation	<ul style="list-style-type: none"> • “While we know percentage wise how many folks have visited the garden and made changes as a result, we don’t know who those people are so we can’t drill down to their water use and look at post and pre visitation to the garden. Ideally, yeah we would do that but we would need time and we’re busy with other things.” (WA5) • “We have no mechanism for telling you how many people heard our water-wise message, whether they incorporated it into their daily lives and whether it changed their plant-buying habits. We don’t have a metric of that kind of empirical feedback on what we do.” (PG3) • “We do our evaluation on face time- how many people we talk to. It is more of a quantitative way. How many people did we reach? At what sort of educational experience was it? How directed to our message was it.” (WA3) • “We always monitor water usage either in the landscape rebate or the outreach and see if there is a decline in usage. That goes into our cost-benefit analysis so we can determine whether <i>x</i> amount of money that were spending on this program actually reduces <i>y</i> amount of gallons.” (WA7)

Visitor Survey

Informational Content

Survey participants at the Water Conservation Garden were asked to rate the value of various types of information and resources about water-wise landscaping provided by the Garden. Their responses are presented in Figure 4.7.

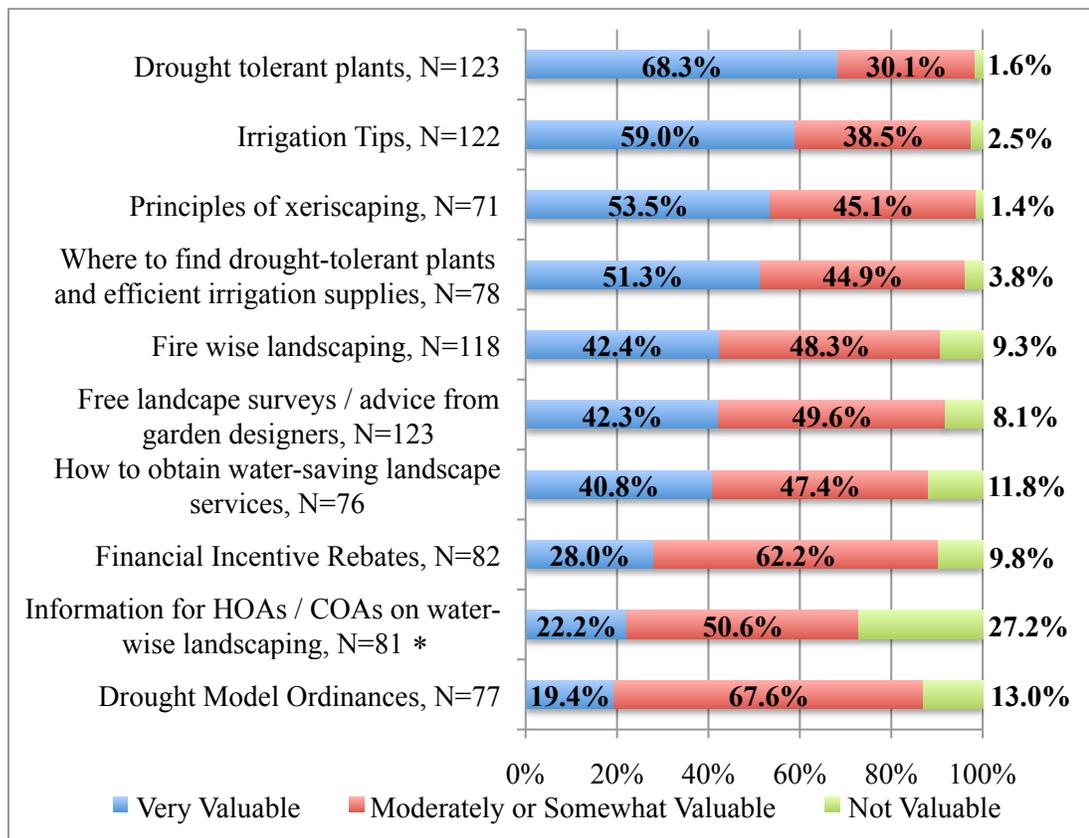


Figure 4.7 Perceived Value of Different Types of Information / Resources About Water-wise Landscaping as Rated by Visitors Participating in Survey at the Water Conservation Garden in El Cajon, California (N= 77 to 123)

* HOA = homeowner association, COA = condominium association

Mode of Information Conveyance

Survey participants were also asked to rank the helpfulness of various modes of communication used in the Water Conservation Garden’s educational outreach about water-wise landscaping. Their responses are presented in Figure 4.8.

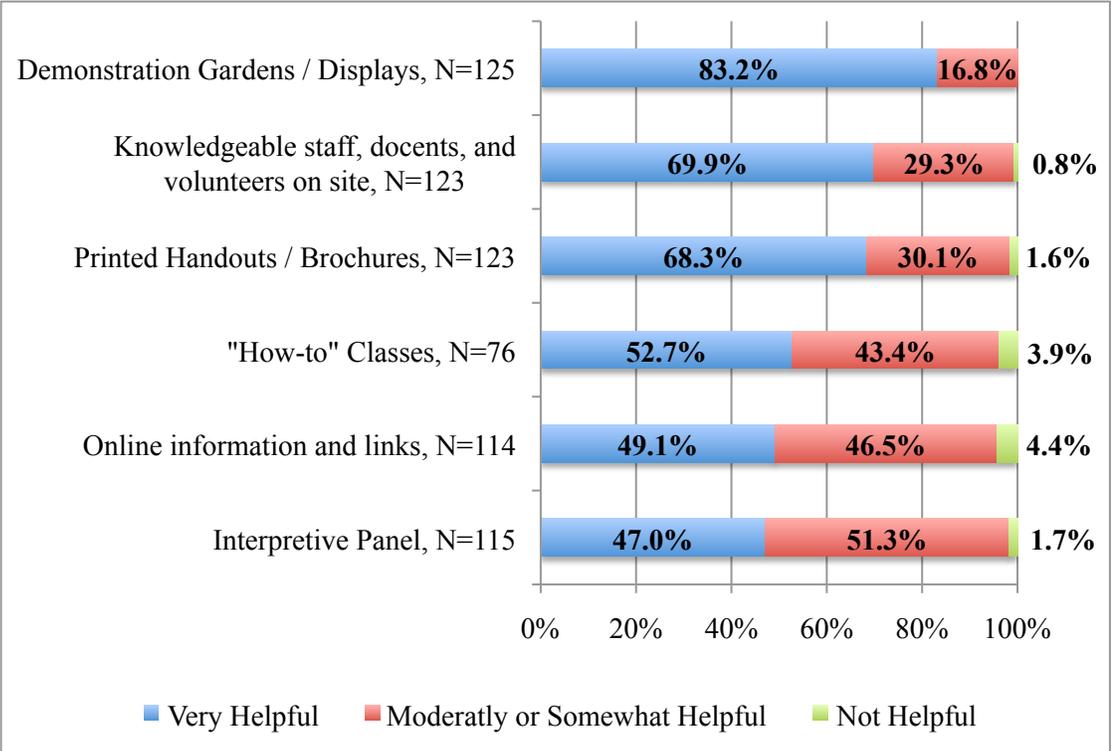


Figure 4.8 Perceived Helpfulness of Various Modes of Communication for Conveying Information About Water-wise Landscaping as Rated by Visitors Participating in Survey at the Water Conservation Garden in El Cajon, California (N=76 to 125)

Chapter 5

DISCUSSION

This chapter is divided into three sections; analysis, summary, and recommendations. The analysis portion is organized by themes developed from case study interviews with key informants. Within that framework, other observations from the case study sites are made and comparisons are drawn between the current state of affairs within public gardens as informed by the APGA survey, and the needs and preferences expressed by participants in the visitor survey. Major findings of this study are discussed and compared with those of other research and conclusions about how gardens can work more effectively to change behavior are presented. The summary delivers some closing thoughts about the role of public gardens as a part of a water-wise landscaping movement. The recommendations section provides a condensed list of specific strategies that gardens can undertake to promote water-wise landscaping.

Analysis

Collaborations

Key informants at all of the case studies identified stakeholder collaborations as essential to a successful campaign to promote water-wise gardening. The specific advantages gained by collaborations were described as borrowed expertise, increased credibility, extended outreach and the potential to achieve sweeping market transformation. The lessons learned from the case study sites on the importance of collaborations stand in stark contrast to the findings of the APGA institutional survey. In the latter, collaborations between public gardens and other stakeholders were reported as uncommon, predominantly informal and without financial implications (Fig. 4.3). This suggests that there is much unrealized collaborative potential for public gardens interested in promoting water-wise landscaping.

Strategic Partners

Although the intensity of collaborations with different entities varied between the case studies (Table 4.1), alliances between public gardens and local agents of the Cooperative Extension, green industry, and a local water utility were present in almost all cases.

Utilities

Public utilities and, in particular, local water providers were observed to play an important role in promoting water-wise landscaping at each of the case study sites in this research. In many instances, the local water utility served as the economic

engine behind outreach campaigns. Beyond pure altruism, their participation in water-wise landscaping campaigns is often motivated by their financial bottom line. One water utility representative alluded to this by saying, “Water saved by conservation is the cheapest method to get more water.” Water utilities also represented a significant opportunity to communicate water-wise landscaping messages to the public through their billing practices and customer service. In addition to water utilities, key informants also identified power companies as logical partners in water-wise landscaping campaigns. This assertion is supported by the increasing attention given to the link between these resources often referred to as the water-energy nexus (National Conference of State Legislatures, 2009).

Green Industry

Key informants at all of the case study sites noted that the green industry has a vital role to play in promoting water-wise landscaping. Several interviewees, including a representative from industry itself, suggested that doing so was essential to ensuring their health and continued prosperity. Collaborations with the green industry were seen as valuable in terms of keeping everyone on the same page and making it easier to reinforce messaging and synchronize efforts, thereby achieving broader market transformation. Examples given included working with growers to identify marketable drought-tolerant species and ensuring their local availability, or collaborating with irrigation manufacturers regarding the promotion and distribution of water-efficient irrigation control systems. Another manifestation of collaborations observed at most case study sites was in the development of water conservation professional training and certification programs.

Cooperative Extension

Cooperative Extension was observed to play an important part in educational outreach about water-wise landscaping across most of the case studies. In particular, key informants commented on the credibility of the Master Gardener Program and its aptitude for propagating messages about water-wise landscaping throughout their communities. In three case studies, Cooperative Extension was also recognized for having played a part in the identification, research and trialing of drought-tolerant plants.

Building Strong Partnerships

Overcoming Polarization

Several key informants at different case study sites indicated that early attempts at collaboration, particularly with the green industry, were fraught with difficulty. This contentiousness was described as having arisen from the perception that demonizing conventional landscaping threatened the livelihood of green industry professionals. Interviewees from both within and outside of the green industry reported their ability to improve these relationships by acknowledging one another's needs and developing ways that all parties could be part of the solution. Key informants also indicated that this process was facilitated by the right personalities, characterized as having a cooperative spirit, patience, avoidance of polarizing language, and the ability to compromise.

Formalizing Relationships

Formal relationships among stakeholders were observed at most of case study sites. Where they existed, key informants credited formal relationships with having a positive impact on the success of their campaigns to promote water-wise landscaping. These individuals commented that a formal relationship facilitated the exchange of ideas and timely communication about new initiatives. Interviewees also suggested that formal relationships confer long-term stability to collaborations thereby mitigating the loss of inertia that can occur between droughts or when specific individuals leave their positions.

Using Financial Incentives

Although financial incentives were not observed at all of the case study sites, they were found to have a pronounced effect where they existed. In two case studies, the local water utility provided compensation to other organizations for delivering water-wise programming. In both cases, they used a performance contract to determine the amount of compensation based on the number of programs delivered or participants engaged. Another financial incentive model centered on the proprietary nature of trademarked plants. Under these programs, the entities involved in the plants' introduction, propagation and marketing were paid royalties as a percentage of total sales. Key informants credited both mechanisms as having motivated collaborators to innovate and expand on their efforts.

Marketing

Using Positive Framing

Many of the interviewees consulted in this research commented on the difficulty of overcoming the negative connotations associated with a xeriscape as a barren, rocky, aesthetic limited to growing cactus. Most informants also described how their campaigns have changed their language to wording that reflects an optimistic philosophy, such as water-saver, water-smart or water-wise. This trend is also evident in the language adopted recently by marketing campaigns such as Water – Use it Wisely, and WaterSense. One individual described this process as trying to communicate to the public “that you are not really taking something away from them but you are actually delivering an enhancement.”

Furthermore, several case study organizations were making a concerted effort to reinforce positive associations with water-wise landscaping through the convivial atmosphere of festivals (Table 4.1). Another strategy observed was the sponsorship of water-wise gardening contests which provide a non-monetary incentive, a practice also endorsed in community-based social marketing that indicates, “public recognition of individual or organizational actions which foster sustainability can be an important source of motivation” (McKenzie-Mohr and Smith, 1999). The importance of positive framing is also well documented within the research on community-based social marketing (McKenzie-Mohr and Smith, 1999).

Employing Multiple Modes of Communication

This research demonstrated that the vehicles employed by APGA member gardens to provide information about water-wise landscaping (Fig. 4.6) were fairly well aligned with the preferences of participants in the visitor survey (Fig. 4.8). For example, printed handouts and brochures about water-wise landscaping, already being provided by many public gardens, were considered very helpful by 68.3% of visitors surveyed. Online information and interpretive panels about water-wise landscaping were less commonly used by gardens and perceived as very helpful by a slightly lower percentage of visitors at 49.1% and 47.0%, respectively.

In addition to the aforementioned modes of communication, case study data also revealed the utilization of several additional techniques (Table 4.1). For example, one case study site had experienced success with a topic-specific, water-wise landscaping e-newsletter, while another was piloting a telephone hotline. In addition, several key informants expressed interest in other technology-based approaches such as water-wise podcasts, blogs, and tweeting. Employing multiple modes of communication is also one of the cornerstones of social marketing (Wilbur, 2006; Silva, 2009). This suggests that public gardens would do well to continue diversifying their approach. While these visitor preferences are a good starting point, gardens should solicit feedback and monitor the usage of different modes of communication.

Branding

Branding campaigns were observed at all case study sites (Table 4.1) and several key informants identified them as having had a positive impact on promoting water-wise landscaping. Specific advantages attributed to branding campaigns by key

informants were increased recognition and adoption of water-wise landscaping products such as drought-tolerant plants and efficient irrigation control systems. One individual commenting on their local branding of drought-tolerant plants said,

“If you just isolate what it takes for people to effectively take action to realign their gardens using these types of plants- well they have to know where to get it what to ask for and they have to have some certainty that plant stock is resilient.”

Most of the branding campaigns observed in this research were of a local or regional nature however, with very little evidence of the adoption of national brands such as Water – Use it Wisely, or WaterSense. At the time of this research, only one public garden had become one of the Environmental Protection Agency’s WaterSense promotional partners (Hogge, 2009). This research indicates that there is potential for greater utilization of branding in public garden efforts to promote water-wise landscaping and rather than being mutually exclusive, local, regional, and national campaigns can reinforce one another.

Engaging Opinion Leaders

Key informants at several case study sites commented on the importance of engaging opinion leaders in the diffusion of water-wise landscaping practices. The potential for public gardens representatives to act in this capacity is evident in the 69.9% of visitors in the El Cajon survey who reported that interactions with knowledgeable staff, docents, and volunteers were very helpful in learning about water-wise landscaping. In addition to public gardens themselves, key informants also identified teachers, garden clubs, homeowner association boards, landscape/irrigation contractors and Master Gardeners as having valuable influence. This last group

functions as part of cooperative extension, which was established as a tool to aid in the diffusion of agricultural innovations (Rogers, 2003). One interviewee described the Master Gardeners as able to carry the message to “every population segment and neighborhood.”

The role of such change agents has also been documented in studies on the diffusion of water conservation (Athanasiadis and Mitkas, 2005) and finds further support from advocates of social-norm marketing (Hoffman, 2009) and community-based social marketing and community-based social marketing (McKenzie-Mohr and Smith, 1999). This research indicates that there is great potential for public gardens to work more strategically in their water-wise landscaping outreach by partnering with these types of opinion leaders.

Normalizing the Behavior

At several of the case studies in this research, organizations were using placards to identify water-wise landscapes at homes, businesses, and public spaces (e.g. libraries, schools) throughout the community. This strategy makes the desired behavior more visible, thereby reinforcing it as a social norm. The effectiveness of this practice relates directly to the theory of planned behavior (Ajzen, 1991) and is also supported by advocates of social-norm marketing (Hoffman, 2009) and community-based social marketing (McKenzie-Mohr and Smith, 1999).

Actionable Recommendations / Resources

Modeling the Desired Behavior

When compared with other modes of communication, demonstration gardens were considered “very helpful” by the highest proportion of participants (83.2%) in the visitor survey in El Cajon (Fig. 4.8). It should be noted however, that this finding may be a function of respondent bias as they represent a “self-selecting” group that had already decided to seek out the garden to experience its demonstrations and displays. In any event, key informants at all of the case study sites expressed overwhelming support for models of water-wise landscaping as a tool for motivating behavioral change. Fortunately, “many public gardens have [already] adopted a mission of modeling and explaining the behavior changes that are need to sustain the environment” (Wolf, 2007). This claim is also supported by the results from this study’s APGA institutional survey (Fig. 4.6), in which demonstration gardens were the vehicle most commonly used by public gardens to educate the public about water-wise gardening, with 78.4% doing so.

Use Relevant Examples

Another important theme that emerged from the case study research suggests that demonstration gardens are most effective when they are relevant to the average homeowner’s experience. Several key informants lamented that traditional public demonstration gardens don’t translate well to a smaller residential scale and, as a result, visitors have a difficult time taking away specific ideas of changes they could make at home. Some case study sites, however, had already invested in miniature

landscape vignettes to demonstrate various water-wise landscaping styles at a scale that visitors can more easily relate to their own yards (Table 4.1).

Tailoring Content to Specific Audiences

This research demonstrated that the type of information and resources about water-wise landscaping being provided by APGA public gardens (Fig. 4.5) are in perfect alignment with participant preferences in the visitor survey at the Water Conservation Garden in El Cajon, California. In this survey, participants were asked to rate the value of various types of information about water-wise landscaping (Fig. 4.7). The results indicated that lists of drought tolerant plants, irrigation tips, and information about the principles of xeriscape design were considered very valuable by the highest proportion of respondents. Serendipitously, these correspond to the types of information most commonly provided by public gardens responding to the APGA institutional survey. Visitor survey participants also expressed a high degree of interest in learning where to find drought-tolerant plants and efficient irrigation supplies, obtaining free landscape audits surveys and advice from garden designers, as well as information about how to obtain water-saving landscape services. Additional support for a focus on actionable resources is the popularity of “how-to” classes, already offered at 71.6% of responding APGA institutions, and considered very helpful by over 50% of participants in the El Cajon visitor survey.

A few key informants expressed concern that a list-based approach is too reductionist and prescriptive, favoring a “right plant in the right place” philosophy instead. This approach, however, may be inherently more complex and this research indicates that the general public is more interested in getting specific suggestions. The

advisability of focusing on simple and straightforward recommendations is supported by both the theory of planned behavior and the principles of community-based social marketing in that such information increases a person's perception of behavioral control and provides them with simple steps to overcome potential barriers (Ajzen, 1991; McKenzie-Mohr and Smith, 1999). In the words of Duval (2007), “[it is] empowering people to take actions that will effect the environment can transform intentions into positive change that will actually make a difference.”

The key informants at several case study sites commented on the effectiveness of tailoring their water-wise landscaping message to particular audiences. Examples included modifying program content to address the needs of specific groups, such as homeowners, developers, and neighborhood associations. One key informant commented that their negative experience with a regionally oriented campaign inspired them to partner locally and develop materials more specifically focused on and appropriate to the conditions of their local area. The effectiveness of identifying and tailoring messages to specific audiences is also supported by research on community-based social marketing (McKenzie-Mohr and Smith, 1999). Our data indicates that gardens should focus on providing the public with actionable and specific recommendations based on their needs. While the types of information and resources described here is a good starting point, gardens should solicit feedback from visitors and tailor content accordingly.

Evaluation

Formative Evaluation

This research indicated that most public garden efforts to promote water-wise landscaping have been developed without the benefit of a needs assessment. In the survey of APGA institutional members, over 70% of respondents indicated that no needs assessment was used in their determination of the types of water-wise landscaping information and resources to provide, or which vehicles to employ in communicating with the public. Of those who reported having conducted a needs assessment to inform their approach, the majority described the process as informal and based on anecdotal feedback from visitors. While most case study key informants interviewed in this research described their process in a similar fashion, one individual indicated that their organization had hired an external agent to conduct focus group interviews and had used those findings to inform their approach to outreach.

Summative Evaluation

Public garden representatives at two case study sites indicated that the impact of their institutions on their communities was evident in changes to the landscape plant palette used locally. Both informants commented that plants introduced, promoted, and distributed by the garden had become more popular and commonplace. They went on to say that their institution also had an indirect effect on plant availability by their influence on local nurseries.

Aside from anecdotal evidence, however, this research found nothing to suggest that any formal evaluation has been done on the impact of public garden efforts to promote water wise landscaping. In fact, several key informants in this

research commented on the difficulty of getting empirical data on the changes in water consumption that result from an individual's exposure to a water-wise landscaping message, exhibit or program.

Two public garden representatives commented that such information would be extremely valuable in terms of helping their organizations tailor message content and delivery to be more effective. As noted by Addelson (2004) the importance of such evaluation has also become increasingly important with respect to program value, as more funding sources expect some form of accountability for their support. Similarly, Wells and Butler (2004) wrote, "establishing specific and measurable outcomes and demonstrating their achievement is the new benchmark for accountability...of all informal education." Key informants from water utilities consulted in this research echoed these sentiments in their comments about the importance of conducting cost-benefit analyses on water conservation programs.

Further Research

There is a need for greater evaluation within public gardens' efforts to promote water-wise landscaping. Formative evaluation and needs assessments represent a great opportunity to tailor more effective program content and delivery. Although this research has yielded some insights with respect to the needs and preferences of visitors, there is a tremendous opportunity for more related research. There is also a need for both detailed and empirical data on the impact on water consumption from public garden efforts to promote water-wise landscaping.

Summary

The sentiment that public gardens are well positioned to take a leadership role in environmental advocacy has been expressed by several public garden professionals such as Duval (2007), who wrote, “Demonstrating sustainable practices in a natural outgrowth of the conservation and education work in botanical gardens, which are certainly amongst the public institutions best suited for this role.” When interviewed for this research, former assistant director at the North Carolina Botanical Garden, Ken Moore, went further to assert that the advocacy role is both an opportunity and an obligation for public gardens saying,

“So its just like we are feeding the pubic what the public wants rather than we are influencing the public for what the public needs to start doing. If you are going to make any real contribution in your profession, you will take leadership and say, ‘We are going to demonstrate what we as a responsible human community should do to live in sync with the softer footprint on this earth.’ Otherwise, hey we’re out of here!”
(Moore, 2009)

This perspective echoes the assertions made by Peck (1978) and Allenstein (1990) who posited that the real objective of this function in public gardens should be to influence public opinion and change behavior. Further support for this claim can also be found from current practitioners outside of public gardens, such as Wolf (2007), who wrote, “Public gardens are providing excellent opportunities for people to learn about and engage in behavior change.”

This observation has been made with specific regard to the issue of water conservation as well. Willison (2007), wrote, “[public gardens] can and are playing a major role in educating people about the critical association between plants and water and empowering them to change their behaviour and attitudes towards a wiser use of

water.” In this research key informants from the green industry, public utilities, and the Cooperative Extension all noted the importance of public gardens in promoting water-wise landscaping. One key informant described public gardens as a “living laboratory” where plants and exhibits can provide a valuable experiential learning opportunity. Several interviewees identified public gardens as having valuable horticultural expertise and credibility within the community, thus serving as an effective focal point for educational outreach.

Although empirical data about the centrality of this particular issue to public gardens’ missions has been sparse, this research indicates that this role is also widely acknowledged by public gardens. In this study’s survey, almost one-third of responding APGA institutions indicated that public education / outreach about water conservation and water-wise landscaping was “very important,” relative to other facets of their mission, while another third characterized it as “moderately important.” Similarly, almost 60% of institutions responding to the survey indicated that they were providing information and resources to the public about water wise landscaping.

Though such attempts to affect behavioral change can be met with resistance, Ken Moore, formerly with the North Carolina Botanical Garden offered some encouragement commenting,

“It takes a decade to develop an idea or concept, its takes a decade to describe and educate about that concept, and it takes a decade to implement that concept...So it takes time.” (Moore, 2009)

Water-wise landscaping, a concept that was first introduced as Xeriscape™ in the late 1970s, is now in its third decade. The concept has certainly evolved, as have our efforts to describe it more articulately and educate the public about it, and we are now

in what Moore (2009) referred to as the “decade of implementation.” The general public is becoming increasingly aware of the need to protect our resources through sustainable practices and this is the time for major advances in the promotion of water-wise landscaping. The following recommendations derived from this research will enable public gardens to play a central and more effective role in the process.

Recommendations

1. **Collaborate with other stakeholders** who have a vested interest in water conservation and water-wise landscaping. In particular, seek out alliances with local utilities, cooperative extension, and the green industry. Develop formal and standing relationships with these entities and, when possible, use financial mechanisms to provide an ongoing incentive for participation. A graphic representation of these relationships and the types of collaborative endeavors they afford is presented in Figure 5.1.
2. **Utilize positive framing** to communicate about water-wise landscaping and emphasize its benefits. Use festivals, contests and garden certification programs to reinforce positive associations with, and reward practitioners of water-wise landscaping.
3. **Employ multiple modes of communication** to deliver messages about water conservation and water-wise landscaping. While technology-based approaches (i.e. website, e-newsletters, blogs, etc.) are on the rise; personal interactions with staff, and printed materials are still considered very helpful.
4. **Adopt / develop branding campaigns** to promote water-wise landscaping products and services tailored to your local audience.
5. **Engage opinion leaders** such as teachers, garden clubs, homeowner association boards, landscape/irrigation contractors and Master Gardeners in the education outreach about water-wise landscaping.
6. **Normalize water-wise landscaping** through high profile events and the distribution of yard signs that highlight the prevalence of water-wise gardens throughout the community.
7. **Model the behavior** by developing demonstration gardens that showcase drought-tolerant plants as well as interpret the fundamentals of water-wise landscaping design and maintenance. When possible, model demonstration gardens on a scale similar to that of residential landscapes and utilizing a variety of styles.
8. **Provide actionable resources** such as irrigation tips, recommendations of locally available drought-tolerant plants, and how to obtain water-wise landscaping services from certified professionals. Consider developing a suite of “how-to” water-wise landscape conversion classes that will empower participants to make changes at home and provide information on any locally available water-wise rebate programs. To the extent possible, tailor content to the specific needs of particular audiences.
9. **Evaluate water-wise programming** by conducting a needs assessment to identify the specific barriers that are inhibiting the public’s adoption of water-wise landscaping and develop content to address these issues accordingly. Evaluate the relative efficacy of different modes of communication by monitoring their usage and soliciting feedback from visitors.

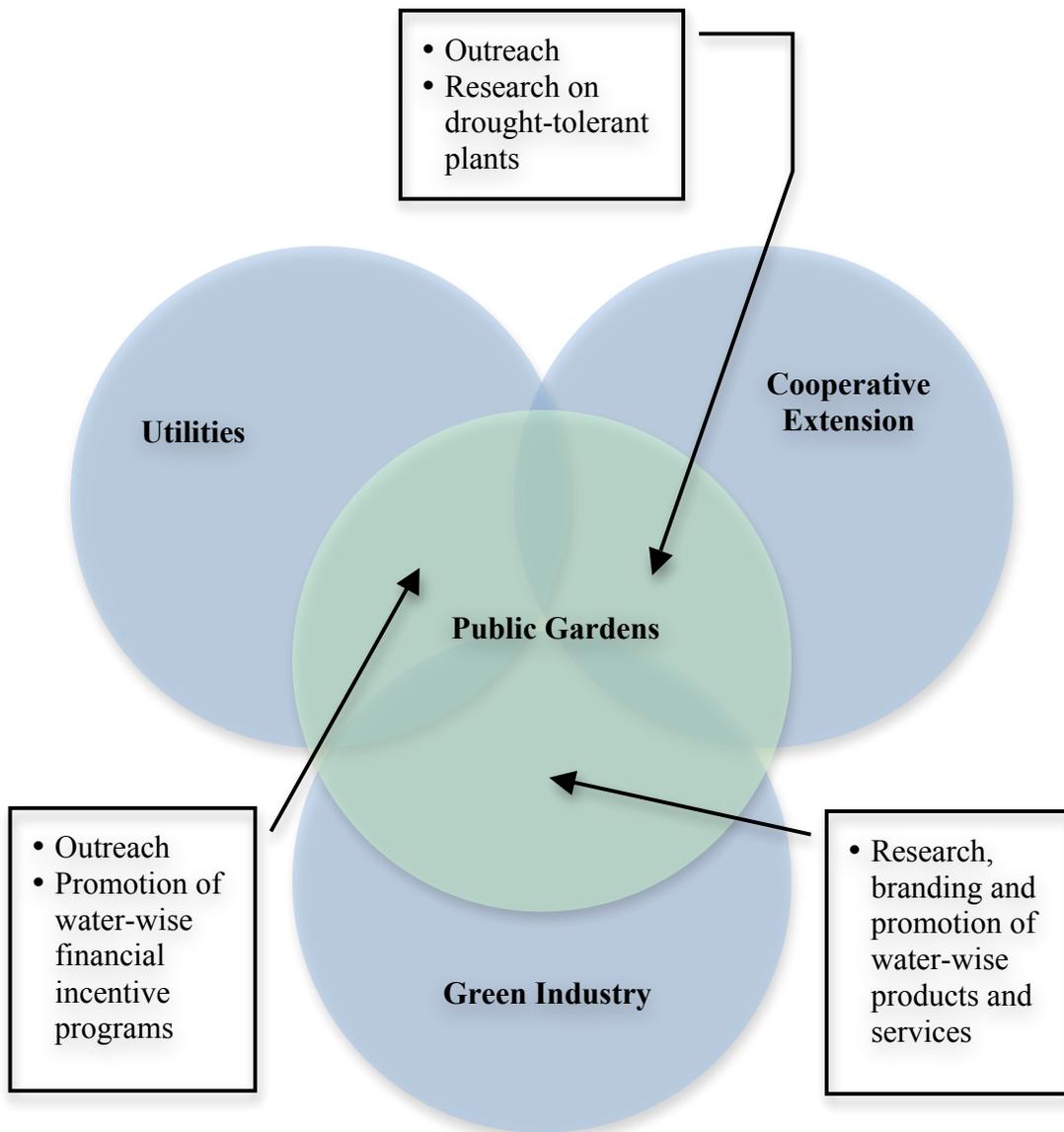


Figure 5.1 Model of a Water-wise Landscaping Campaign Showing the Potential Relationships and Collaborative Endeavors Between Public Gardens and Other Stakeholders

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Appendix A

RESEARCH PROTOCOL FOR SURVEY OF INSTITUTIONAL MEMBERS OF THE AMERICAN PUBLIC GARDENS ASSOCIATION

The Role of Public Gardens in Promoting Water-wise Landscaping

This survey investigates the role of public horticulture institutions with regard to promoting water-wise landscaping. The study is being conducted by Daniel Stern, a second year Fellow in the Longwood Graduate Program, at the University of Delaware. Results of the survey will be included in a Master's thesis and will be available upon request. The survey will take approximately 5-10 minutes to complete.

Your name will remain anonymous.

Your participation is entirely voluntary.

This data will remain confidential and viewed only by the study team. To protect confidentiality, personally identifiable information in the downloaded data files will be stored separately and securely from the rest of the survey response data. The data will be destroyed after 2 years.

If you have any questions concerning the study, please contact the principal investigator Daniel Stern, Longwood Graduate Program, University of Delaware at dstern@udel.edu. For questions about your rights as a subject or about any issues concerning the use of human subjects in research, please contact the Chair, Human Subjects Review Board, University of Delaware, (302) 831-2136. The purpose of this research is to understand how public gardens can best serve in this capacity, so please be candid with your opinions.

Please complete as many questions in their entirety as possible.

Thank you for participating.

1. In what state, country, or continent is your institution located?
(Please select from the drop down menu below)

2. What is the annual visitation at your institution? (Please place an
“x” in the box to the left of your selection)

Response	Answer
	Less than 100,000 visitors
	100,000 - 250,000 visitors
	250,000 - 500,000 visitors
	500,000 - 750,000 visitors
	More than 750,000 visitors

3. What is the range of your institution’s annual operating budget?
(Please place an “x” in the box to the left of your selection)

Response	Answer
	Less than \$500,000 (US Dollars)
	\$500,000 - \$1,000,000 (US Dollars)
	1-3 Million (US Dollars)
	More than 3 Million (US Dollars)

4. How many full-time equivalent staff (FTE) work at your institution?
(Please place an “x” in the box to the left of your selection)

Response	Answer
	Less than 10 FTE
	10-30 FTE
	30-50 FTE
	More than 50 FTE

5. Would you describe your institution as an independent entity or subsidiary of another entity (e.g. University, Water Provider, Municipality, Parks Department)? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Independent entity
	Subsidiary

6. If your institution is a subsidiary, please describe the nature of the larger organization. (Please place an “x” in the box to the left of your selection)

Response	Answer
	College / University
	Water Provider
	Municipality (please name the department)
	Other (please describe)

7. Please rank the following funding sources so that they reflect the proportion of operational funding covered by each, starting with your largest source of operational funding as #1.

Response	Answer
	Governmental Support
	Earned revenue (admission, membership, program fees, events)
	Donations (including endowment income)
	Other (please describe)
	Other (please describe)

8. Please place an “x” under the response that best represents your institution

Question	Very Important	Moderately Important	Slightly Important	Not Important
The importance of practicing water conservation in my institution’s operations, including landscapes and facilities is...				

9. Please place an “x” under the response that best represents your institution

Question	Very Important	Moderately Important	Slightly Important	Not Important
Relative to other aspects of my institution's mission, public education / outreach about water conservation & water-wise gardening is...				

10. Indicate which (if any) of the following stakeholders are collaborating with your institution to promote water-wise gardening? (Please place an “x” under the response that best describes the relationship)

	Not collaborating	Informal relationship	Formal relationship (e.g. committee, forum, task force)	Formal relationship with financial arrangement
Local Water Provider				
Municipality				
Landscape / Irrigation Contractors				
Greenhouse / Nursery Association				
School System				
Others (please describe)				

11. Does your institution provide information / resources to the general public about water-wise gardening? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

*** If the answer is “no,” please skip to the last question (#17) of the survey.**

12. Which of the following types of information / resources is your institution providing about water-wise gardening? (Please place an "x" in the box to the left of all that apply)

Response	Answer
	Information on water-wise garden design (e.g. the "7 principles of xeriscaping")
	Information about where to obtain drought-tolerant plants
	Irrigation tips for conserving water
	Information about where to obtain professional services for water-wise garden design, installation, and maintenance
	Information for HOAs / COAs on the benefits of water-wise gardening
	Information about local water restrictions
	Information about locally available financial incentives / rebates for water-wise gardens
	Lists of recommended drought-tolerant plants
	Information about where to see good examples of water-wise gardens
	Other (please describe)

13. What (if any) types of "needs assessment" has your institution used to determine which types of information / resources to provide? (Please place an "x" in the box to the left of your selection)

Response	Answer
	None
	Formal (please describe)
	Informal (please describe)

14. Which of the following vehicles does your institution use to provide information / resources about water-wise gardening?
(Please place an "x" in the box to the left of all that apply)

Response	Answer
	Printed handouts / brochures
	Interpretive panels
	Demonstration gardens / displays
	Tours about water-wise gardening
	On-line information and links
	"How to" classes
	Special events (please describe)
	Speaking to garden clubs or other groups about water-wise gardening
	Other (please describe)

15. What (if any) types of "needs assessment" has your institution used to determine which vehicles to employ in providing this information? (Please place an "x" in the box to the left of your selection)

Response	Answer
	None
	Formal (please describe)
	Informal (please describe)

16. What (if any) types of evaluation has your institution conducted on its efforts to promote water-wise gardening? (Please place an “x” in the box to the left of your selection)

Response	Answer
	None
	Program participant evaluations
	Visitor surveys
	Other (please describe)

17. Which of the following best describes your role within your institution? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Administration
	Horticulture / Operations
	Education
	Other (please describe)

Thank you for taking the time to complete this survey.

When completed (1 response set per institution), please email this document back to Daniel Stern at the address below.

Daniel Stern dstern@udel.edu

Louise Roselle Graduate Fellow

Longwood Graduate Program

University of Delaware

126 Townsend Hall

Newark, DE 19716

Tel: (302) 831-2517

Fax: (302) 831-3651

<http://www.udel.edu/longwoodgrad>

Appendix B

HUMAN SUBJECT REVIEW BOARD APPROVAL OF RESEARCH PROTOCOL FOR INSTITUTIONAL MEMBERS OF THE AMERICAN PUBLIC GARDENS ASSOCIATION

Gmail - RE: HSRB Review of Institutional Questionnaire

3/19/10 4:58 PM



Daniel Stern <stern.daniel.b@gmail.com>

RE: HSRB Review of Institutional Questionnaire

University of Delaware - HSRB <hsrb-research@udel.edu>
To: "stern.daniel.b@gmail.com" <stern.daniel.b@gmail.com>

Fri, May 15, 2009 at 9:08 AM

Dan,

Because the information you are seeking is primarily factual, rather than beliefs and opinions, I do not see this as human subjects research. No IRB approval is required. Thank you for submitting the protocol, and best of luck with the project!

Missy
Elizabeth Peloso
Director of Compliance
Research Office
University of Delaware
Newark, DE 19716
302-831-2137

-----Original Message-----

From: Dan Stern [mailto:dstern@UDel.Edu]
Sent: Wednesday, May 13, 2009 7:36 PM
To: University of Delaware - HSRB
Subject: HSRB Review of Institutional Questionnaire

Hello, I am submitting the attached institutional questionnaire for HSRB approval. I believe that it may fall under exemption #2. Although some subjects may be identifiable, the information obtained will not put them at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Thanks,
Dan Stern
Longwood Graduate Program

Appendix C

INVITATION TO PARTICIPATE IN ONLINE SURVEY OF INSTITUTIONAL MEMBERS OF THE AMERICAN PUBLIC GARDENS ASSOCIATION

Dear APGA Institutional Member,

I am a second-year student in the Longwood Graduate Program in Public Horticulture at the University of Delaware currently under the guidance of Dr. Robert Lyons. My Master's thesis focuses on public gardens and water-conservation. In hopes of capturing a "snapshot" of the current state of affairs on this issue, I am distributing a survey to all institutional members of the American Public Gardens Association. Could you please complete this online survey? In addition to gathering some basic demographic information about your institution, the survey is geared toward learning what (if any) sort of collaborations, public outreach, and/or education efforts in which your organization is engaged to promote water-wise landscaping. Most questions will be short and simple. The survey should only take 5-10 minutes. Go to the following link, which will be available for the next two weeks.

https://delaware.qualtrics.com/SE?SID=SV_d521qzAGQmuj6Ju&SVID=Prod

I greatly appreciate your participation and know that it will be of tremendous help in my research.

Sincerely,

Daniel Stern
Louise Roselle Graduate Fellow
Longwood Graduate Program
University of Delaware
126 Townsend Hall
Newark, DE 19716
Tel: (302) 831-2517
Fax: (302) 831-3651
<http://www.udel.edu/longwoodgrad>

Appendix D

DEMOGRAPHICS OF RESPONDENTS AND ORGANIZATIONS IN SURVEY OF INSTITUTIONAL MEMBERS OF THE AMERICAN PUBLIC GARDEN ASSOCIATION

Survey participants were asked to characterize their position within their institution and the responses are presented in Table D.1.

Table D.1 Distribution of Respondents by Position in American Public Gardens Association Institutional Survey (N=127)

Position	Number of Respondents	Percentage of Respondents
Administration	64	50.4%
Horticulture / Operations	47	37.0%
Education	8	6.3%
Other	8	6.3%
Total	127	100.0%

Geographic Distribution

The geographic distribution of respondents is presented in Tables D.2 and D.3. In Table D.2, the proportion of survey respondents from each state or country is depicted alongside the proportion of APGA institutional members who were invited to participate from the same state or country. There were no survey respondents from

Australia or the states of Colorado, Kansas, Mississippi, Montana, New Hampshire, North Dakota, Oklahoma, Oregon, Rhode Island, Vermont, West Virginia or Wyoming. Collectively these locations comprised 7.1% of the APGA institutional members invited to participate in the survey. The respondents were then grouped into the broader regional categories of Midwest, Northeast, South, West and Other. Their distribution within these regions is presented in Table D.3.

Table D.2 Geographic Distribution of Responding Institutions by State / Country in American Public Gardens Association Institutional Survey (N=127)

Location	Number of Survey Responses	Percentage of Survey Responses	Percentage of APGA Institutional Membership
Alabama	1	0.8%	1.1%
Alaska	1	0.8%	0.7%
Arizona	1	0.8%	2.1%
Arkansas	1	0.8%	1.1%
Maine	1	0.8%	0.5%
Massachusetts	1	0.8%	1.8%
Nebraska	1	0.8%	0.2%
Nevada	1	0.8%	0.2%
New Mexico	1	0.8%	0.5%
South Carolina	1	0.8%	1.8%
South Dakota	1	0.8%	0.5%

Location	Number of Survey Responses	Percentage of Survey Responses	Percentage of APGA Institutional Membership
Utah	1	0.8%	0.5%
Connecticut	2	1.6%	0.7%
Georgia	2	1.6%	2.7%
Hawaii	2	1.6%	1.1%
Idaho	2	1.6%	0.5%
Louisiana	2	1.6%	0.9%
Minnesota	2	1.6%	0.5%
New Jersey	2	1.6%	3.0%
Tennessee	2	1.6%	1.8%
Iowa	3	2.4%	1.8%
Washington	3	2.4%	1.8%
Canada	4	3.1%	3.9%
Delaware	4	3.1%	1.4%
Illinois	4	3.1%	4.1%
Indiana	2	1.6%	1.6%
Kentucky	4	3.1%	1.8%
Maryland	4	3.1%	2.1%
Texas	3	2.4%	2.5%
Virginia	2	1.6%	2.5%
Ohio	4	3.1%	4.3%

Location	Number of Survey Responses	Percentage of Survey Responses	Percentage of APGA Institutional Membership
Wisconsin	3	2.4%	2.5%
Michigan	5	3.9%	2.3%
Missouri	6	4.7%	2.1%
Pennsylvania	5	3.9%	7.8%
Florida	6	4.7%	4.8%
New York	7	5.5%	6.4%
North Carolina	8	6.3%	4.3%
California	15	11.8%	8.7%
Other	5	3.9%	3.9%
Not Responding	2	1.6%	7.1%
Total	127	100.0%	100.0%

Table D.3 Distribution of Responding Institutions by Region in American Public Gardens Association Institutional Survey (N=127)

Region	States / Countries Represented Amongst Survey Respondents	Number of Survey Respondents	Percentage of Survey Respondents	Percentage of APGA Institutions
Midwest	Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, Wisconsin	33	26.0%	21.1%
Northeast	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York, Pennsylvania	26	20.5%	23.6%
South	Alabama, Arkansas, Florida, Georgia, Louisiana, North Carolina, South Carolina, Tennessee, Texas, Virginia	28	22.0%	23.8%
West	Alaska, Arizona, California, Hawaii, Idaho, Nevada, New Mexico, Utah, Washington	27	21.3%	16.0%
Other	Canada, Nebraska, South Dakota, Other	13	10.2%	8.5%
Total		127	100%	100%

Type of Institution

The types of institutions represented by APGA survey respondents are shown in Figure D.1. Of the 8.2% of respondents who identified with “Other type of subsidiary,” most affiliated themselves with a federal, regional, or county parks system in the write-in-answer opportunity provided.

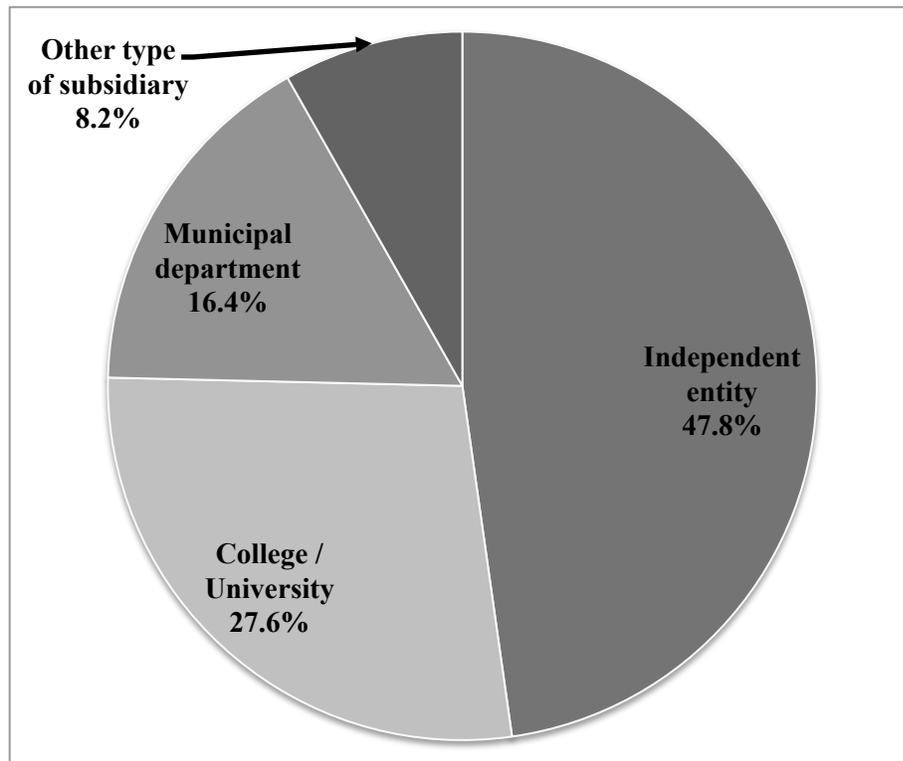


Figure D.1 Distribution of Responding Institutions by Type in American Public Gardens Association Survey (N=127)

Annual Operating Budget

The budgetary size of institutions represented by APGA survey respondents is shown in Figure D.2.

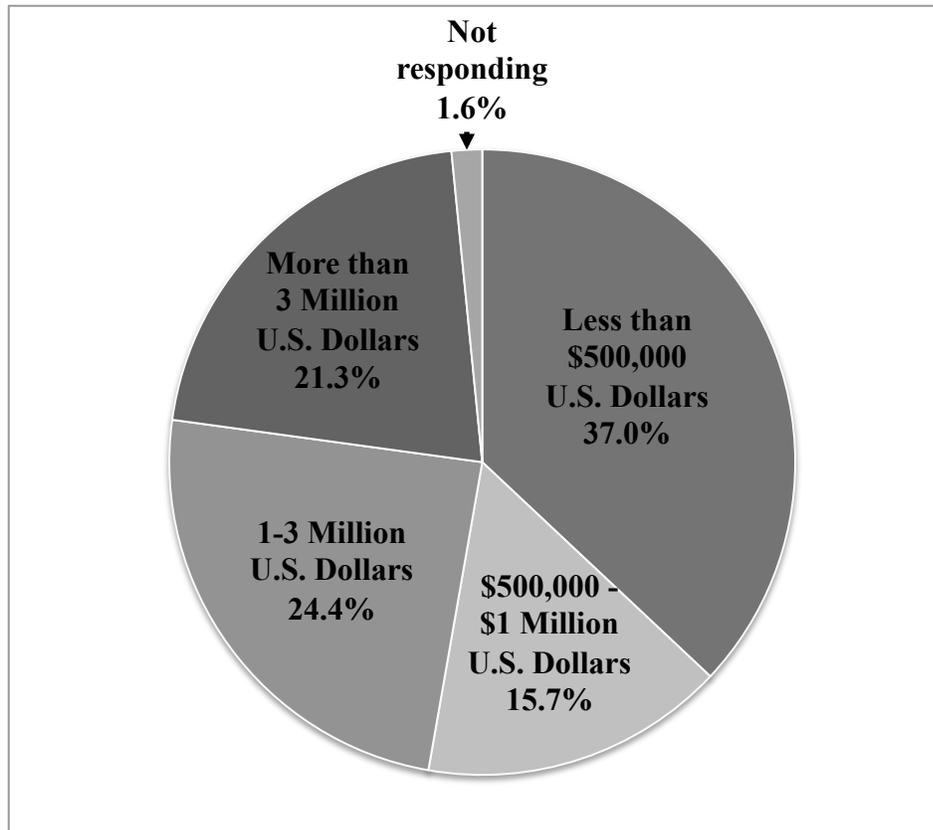


Figure D.2 Distribution of Responding Institutions by Annual Operating Budget in American Public Gardens Association Survey (N=127)

Sources of Funding

The primary sources of funding for the institutions represented by APGA survey respondents are shown in Figure D.3.

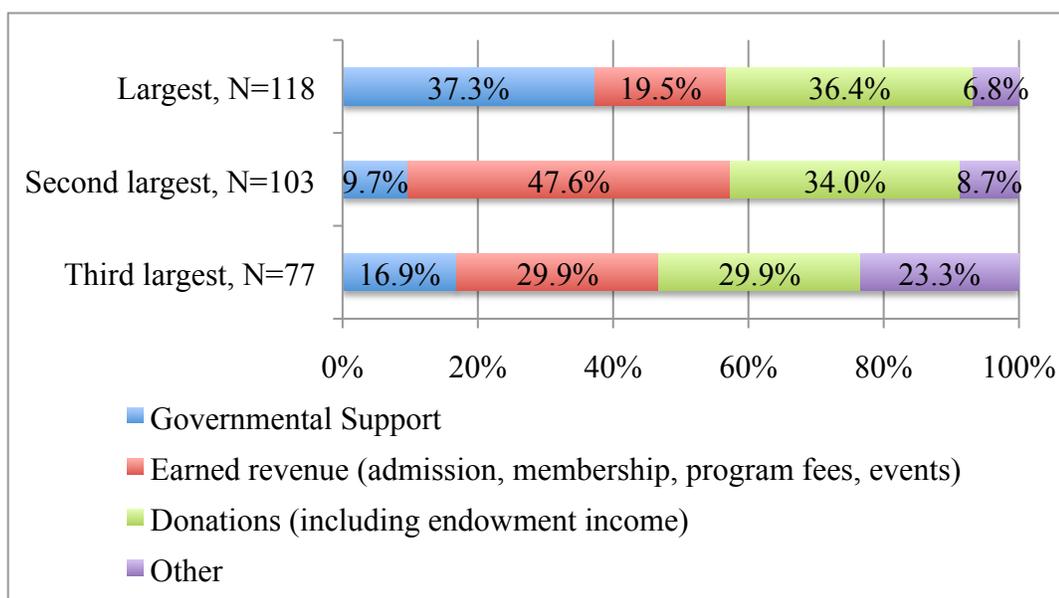


Figure D.3 Sources of Funding Amongst Responding Institutions in American Public Gardens Association Survey (N=77 to 118)

Annual visitation

The annual visitation of institutions represented by APGA survey respondents is shown in Figure D.4.

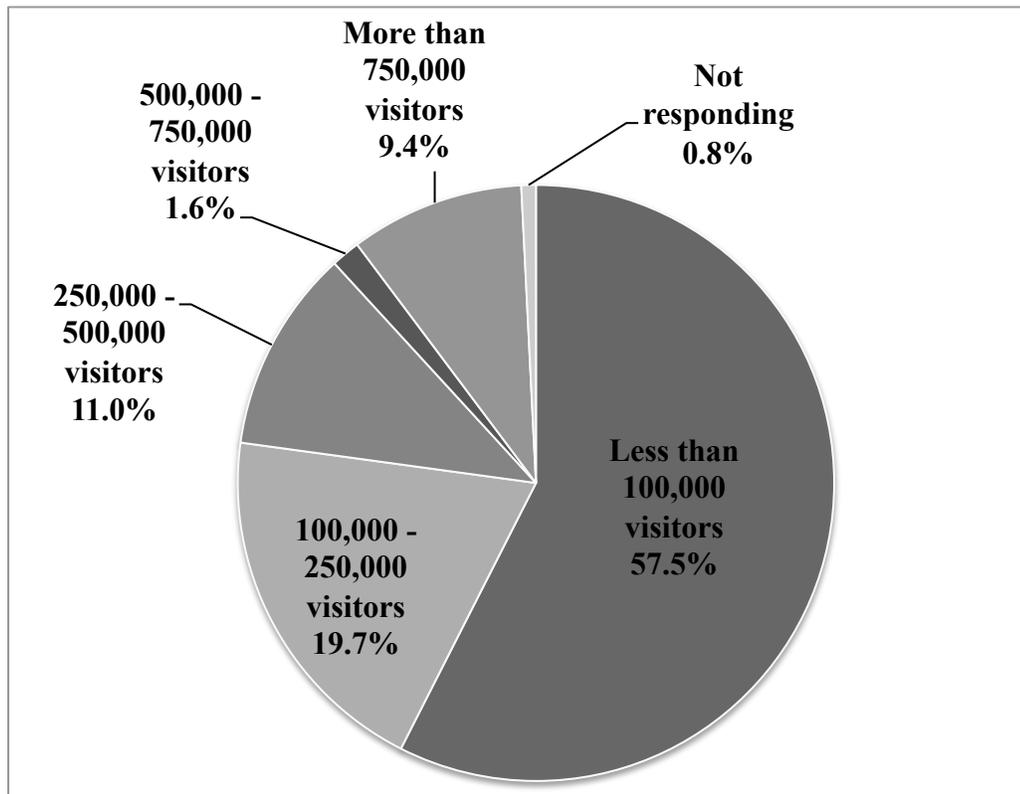


Figure D.4 Distribution of Responding Institutions by Annual Visitation in American Public Gardens Association Survey (N=127)

Number of Staff

The number of full-time equivalents (FTE) staff employed at institutions represented by APGA survey respondents is shown in Figure D.5.

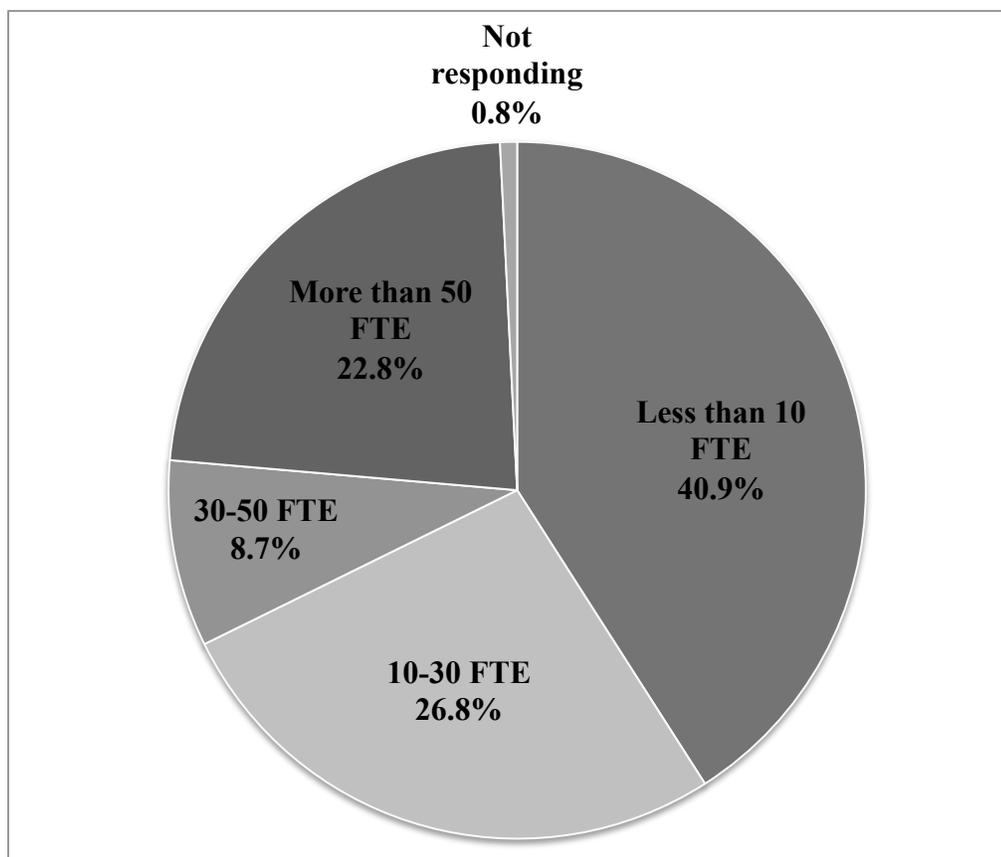


Figure D.5 Distribution of Responding Institutions by Number of FTE Staff in American Public Gardens Association Survey (N=127)

Appendix E

CASE STUDY SELECTION QUESTIONNAIRE

1. What is the annual visitation at your institution?
2. What is the size and scope of your institution's operating budget?
3. What is the percentage breakdown of its primary funding sources?
4. Would you describe the institution as an independent entity or subsidiary of another entity (e.g. Water Provider, Municipality, Parks Department)? If a subsidiary, please describe how your institution fits within the larger organization.
5. How significant is education about water conservation and water-wise landscaping relative to other aspects of your institution's mission?
6. Has your institution conducted any evaluation of its efforts to promote water-wise landscaping? Please describe.
7. Is your institution allied with other professional organizations or stakeholders in its efforts promote water-wise landscaping? Formally or informally? Please describe.

Appendix F

RESEARCH PROTOCOL FOR INTERVIEWS OF PUBLIC GARDEN STAFF

1. What types of information and programs about water-wise landscaping is your organization providing (or has provided) to the public?
 - a. How / why did your institution decide to invest its resources in these particular initiatives?
 - b. If there are any initiatives that your institution has discontinued, why were they terminated?
 - c. What (if any) types of evaluation are you conducting on these initiatives?
 - d. What are the metrics of success?

2. In what ways (if any) is your organization collaborating (or has collaborated) with other professional entities to promote water-wise landscaping? With whom?
 - a. How / why did your organization decide to invest its resources in these particular collaborations?
 - b. What were critical factors in the evolution of the relationship?
 - c. What are logistics of your current relationship with these entities?
 - d. What (if any) types of evaluation are you conducting on these collaborations?
 - e. What have been the specific advantages / major successes?
 - f. What are the metrics of success?

3. Describe the challenges (if any) that your organization has faced in developing / maintaining productive relationships with these entities?
 - a. Please describe any collaborative efforts that you attempted and failed
 - b. Please describe any collaborative efforts that your organization has started but later discontinued
 - i. Why were they terminated? How was that decision made?

4. If your organization were not constrained by resources or politics, what types of new initiatives, programs, partnerships, would you like to consider to further promote water-wise landscaping?
 - a. What are the barriers to doing so?

Appendix G

RESEARCH PROTOCOL FOR INTERVIEWS OF NON-GARDEN KEY INFORMANTS

1. What types of information and programs about water-wise landscaping is your organization providing (or has provided) to the public?
 - a. How / why did your institution decide to invest its resources in these particular initiatives?
 - b. If there are any initiatives that your institution has discontinued, why were they terminated?
 - c. What (if any) types of evaluation are you conducting on these initiatives?
 - d. What are the metrics of success?

2. In what ways (if any) is your organization collaborating (or has collaborated) with the local public garden to promote water-wise landscaping?
 - a. How / why did your organization decide to invest its resources in this particular collaboration?
 - b. What were critical factors in the evolution of the relationship?
 - c. What are logistics of your current relationship with the local public garden?
 - d. What (if any) types of evaluation are you conducting on these collaborations?
 - e. What have been the specific advantages / major successes?
 - f. What are the metrics of success?

3. Describe the challenges (if any) that your organization has faced in developing / maintaining productive relationships with the local public garden?
 - a. Please describe any collaborative efforts that you attempted and failed
 - b. Please describe any collaborative efforts that your organization has started but later discontinued
 - i. Why were they terminated? How was that decision made?

4. Are there other professional organizations / stakeholders that you collaborate with to promote water-wise landscaping? (Please describe relationship)
 - a. Water Provider
 - b. Green Industry
 - i. Landscape Contractors
 - ii. Greenhouse / Nursery Growers
 - iii. Irrigation Contractors
 - c. Government Entities
 - d. Other

5. If your organization were not constrained by resources or politics, what types of new initiatives, programs, partnerships, would you like to consider to further promote water-wise landscaping?
 - a. What are the barriers to doing so?

Appendix H

HUMAN SUBJECT REVIEW BOARD APPROVAL OF RESEARCH PROTOCOL FOR INTERVIEWS WITH PUBLIC GARDEN STAFF

HUMAN SUBJECTS PROTOCOL University of Delaware

Protocol Title: The mechanics of collaborations with professional allies in public gardens' efforts to promote water-wise landscaping (Internal agents)

Principal Investigator

Name: Daniel Stern
Contact Phone Number: (919) 260-7143
Email Address: dstern@udel.edu

Advisor (if student PI):

Name: Dr. Robert Lyons
Contact Phone Number: (302) 831-2517
Email Address: rlyons@udel.edu

Other Investigators:

Type of Review:

Exempt Expedited Full board

Exemption Category: 1 ② 3 4 5 6

Minimal Risk: yes no

Submission Date: 5/13/09

HSRB Approval Signature <i>Elizabeth Duggan Pelose</i>	Approval Date <i>6/19/09</i>
HS Number <i>XMP 443</i>	Approval Next Expires <i>N/A</i>

Investigator Assurance:

By submitting this protocol, I acknowledge that this project will be conducted in strict accordance with the procedures described. I will not make any modifications to this protocol without prior approval by the HSRB. Should any unanticipated problems involving risk to subjects, including breaches of guaranteed confidentiality occur during this project, I will report such events to the Chair, Human Subjects Review Board immediately.

Appendix I

HUMAN SUBJECT REVIEW BOARD APPROVAL OF RESEARCH PROTOCOL FOR INTERVIEWS WITH NON-GARDEN KEY INFORMANTS

HUMAN SUBJECTS PROTOCOL University of Delaware

Protocol Title: The mechanics of collaborations with professional allies in public gardens' efforts to promote water-wise landscaping (External agents)

Principal Investigator

Name: Daniel Stern
Contact Phone Number: (919) 260-7143
Email Address: dstern@udel.edu

Advisor (if student PI):

Name: Dr. Robert Lyons
Contact Phone Number: (302) 831-2517
Email Address: rlyons@udel.edu

Other Investigators:

Type of Review:

Exempt Expedited Full board

Exemption Category: 1 2 3 4 5 6

Minimal Risk: yes no

Submission Date: 5/13/09

HSRB Approval Signature <i>Elizabeth Douglas Peltoso</i>	Approval Date <i>6/19/09</i>
HS Number <i>XMP 442</i>	Approval Next Expires <i>n/a</i>

Investigator Assurance:

By submitting this protocol, I acknowledge that this project will be conducted in strict accordance with the procedures described. I will not make any modifications to this protocol without prior approval by the HSRB. Should any unanticipated problems involving risk to subjects, including breaches of guaranteed confidentiality occur during this project, I will report such events to the Chair, Human Subjects Review Board immediately.

Appendix J

RESEARCH PROTOCOL FOR VISITOR SURVEY AT THE WATER CONSERVATION GARDEN IN EL CAJON, CALIFORNIA

The Role of Public Gardens in Promoting Water-wise Landscaping

This survey investigates the role of public horticulture institutions with regard to promoting water-wise landscaping. The study is being conducted by Daniel Stern, a second year Fellow in the Longwood Graduate Program, at the University of Delaware. Results of the survey will be included in a Master's thesis and will be available upon request. The survey will take approximately 5-10 minutes to complete.

Your name will remain anonymous.

Your participation is entirely voluntary.

This data will remain confidential and viewed only by the study team. To protect confidentiality, personally identifiable information in the downloaded data files will be stored separately and securely from the rest of the survey response data. The data will be destroyed after 2 years.

If you have any questions concerning the study, please contact the principal investigator Daniel Stern, Longwood Graduate Program, University of Delaware at dstern@udel.edu. For questions about your rights as a subject or about any issues concerning the use of human subjects in research, please contact the Chair, Human Subjects Review Board, University of Delaware, (302) 831-2136. The purpose of this research is to understand how public gardens can best serve in this capacity, so please be candid with your opinions.

Please complete as many questions in their entirety as possible.

Thank you for participating.

1. How old are you? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Less than 21 years old
	21-40 years old
	41-65 years old
	More than 65 years old

2. Do you live in San Diego County? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

a. If so, please select the name of your local water district from the drop down menu below

3. Do you own your own home? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

4. Do you garden at home? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

5. How did you find out about the Water Conservation Garden?
(Please place an “x” in the box to the left of your selection)

Response	Answer
	From a friend or relative
	My local water authority
	Local Media (e.g. newspaper article, TV, advertisement)
	Internet
	Other (please describe)

6. How many times have you visited the Water Conservation Garden before? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Never (first time visitor)
	1-3 visits
	4-6 visits
	7-10 visits
	More than 10 visits

7. How many years have you been a member of the Water Conservation Garden? (Please place an “x” in the box to the left of your selection)

Response	Answer
	None (non-member)
	1-3 years
	4-6 years
	7-10 years

8. Have you ever participated in a class at the Water Conservation Garden? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

9. Have you ever attended a lecture at the Water Conservation Garden? (Please place an “x” in the box to the left of your selection)

Response	Answer
	Yes
	No

10. How important (if at all) were the following in your decision to visit The Water Conservation Garden? (Please place an “x” in the box that best reflects your opinion)

Answer	Very Important	Moderately Important	Somewhat Important	Not Important
To get exercise / be outdoors				
To see beautiful plants				
To learn about plants / nature				
To learn about gardening				
To learn about water conservation				

11. How valuable are the following resources provided by The Water Conservation Garden? (Please place an “x” in the box that best reflects your opinion)

Answer	Very Valuable	Moderately Valuable	Somewhat Valuable	Not Valuable
Lists of drought-tolerant plants				
Irrigation tips				
Information about water-wise landscape design (i.e. the 7 principles of xeriscaping)				
Where to find drought tolerant plants and efficient irrigation supplies				
Information about fire-wise landscaping				
Information about how to obtain free landscape surveys / advice from garden designers				
Information about how to obtain water-wise landscaping services				
Information about locally available financial incentive rebates for water-wise landscaping				
Information for HOAs / COAs on water-wise landscaping				
Information about drought-model ordinances				

12. The garden provides landscape water conservation information in a variety of ways. How helpful do you find the following forms?
(Please place an "x" in the box that best reflects your opinion)

Answer	Very Helpful	Moderately Helpful	Somewhat Helpful	Not Helpful
Printed handouts / brochures				
Interpretive panels				
Demonstration gardens / displays				
Knowledgeable staff, docents, and volunteers				
On-line information and links				
"How to" classes (e.g. Bye-bye Grass)				

Appendix K

HUMAN SUBJECT REVIEW BOARD APPROVAL OF RESEARCH PROTOCOL FOR VISITOR SURVEY AT THE WATER CONSERVATION GARDEN IN EL CAJON, CALIFORNIA

Gmail - RE: Approval of Research Survey

3/19/10 5:23 PM



Daniel Stern <stern.daniel.b@gmail.com>

RE: Approval of Research Survey

University of Delaware - HSRB <hsrb-research@udel.edu>
To: Dan Stern <dstern@udel.edu>

Fri, Mar 27, 2009 at 8:22 AM

Dan,

Because your protocol is exempt, you do not need any further documentation.

Missy

-----Original Message-----

From: Dan Stern [mailto:dstern@UDel.Edu]

Sent: Thursday, March 26, 2009 6:19 PM

To: University of Delaware - HSRB

Subject: Re: Approval of Research Survey

Missy, thanks for the note. I was glad to hear that the additional questions were ok. I am planning to begin administering the survey this Saturday 3/28, so I would really appreciate it if you can send me the official approval tomorrow (Friday). If you need to reach me by phone, my # is 919-260-7143.
Thanks so much for all of your help,
Dan Stern

Dan Stern wrote:

> Missy,

> If its is not too late..I have added two questions to the survey

> (attached). I also changeed the age groups as we discussed. If

> everything looks ok, please accept changes and send back to me as a pdf.

>

> Thanks,

> Dan Stern

> 919-260-7143

>

> Dan Stern wrote:

>> Missy,

>> Thank you for the comments. I have taken them to heart and have made

>> some additional (minor) revisions. I have attached two copies..the

>> one ending in TC shows the track changes, the other is the cleaned up

>> version with instruction page removed.

>> Thanks,

>> Dan

>>

>> Dan Stern wrote:

>>> Hello again, I realized that I had not indicated that the project is

>>> not externally funded and have amended this version. I apologize for

>>> the duplication. Please let me know if you need any further

>>> information.

https://mail.google.com/mail/?ui=2&ik=860b23b987&view=pt&as_sub..%2F25%2F09&as_within=1w&search=adv&msg=12047e213b59572c&dsqt=1 Page 1 of 2

Appendix L

DEMOGRAPHICS OF RESPONDENTS IN VISITOR SURVEY AT THE WATER CONSERVATION GARDEN IN EL CAJON, CALIFORNIA

Location

All of the 104 participants who provided their location of residence indicated that they lived in San Diego County. Of these, 91 also gave the name of their water provider. 76.9% of respondents indicated that they were customers of one of the five water agencies that comprise the Water Conservation Garden's Joint Powers Authority, namely, the City of San Diego (30.7%), Helix (28.6%), Otay (12.1%), San Diego County Water Authority (2.2%), and Sweetwater (3.3%). 23.1% of respondents reported being a customer of one of the county's other water agencies.

Home Ownership and Gardening Activity

When asked if they owned their own home, 88.9% of 108 respondents replied, "Yes," while 11.1% answered "No." When asked if they gardened at home, a similar proportion, 94.4% of 108 respondents, replied, "Yes," while 5.6% said "No."

Age

Out of the 82 participants responding to a question about their age, survey results indicated that 13.4% were between 21 and 40 years old, 65.9% were between the ages of 41 and 65 years old, and 20.7% were over 65 years old.

Familiarity with the Water Conservation Garden

Method of Acquaintance with Garden

When asked about how they first learned of the Water Conservation Garden, 42 of 100 respondents chose “Local Media,” 29 selected “A friend or relative,” 7 replied “My local water authority,” and only 2 said “Internet.” Of the 20 respondents who answered, “Other,” many indicated that they heard about the garden from Cuyamaca College or the region’s Sunset Magazine.

Previous Visitation, Garden Membership, and Program Participation

Survey participants were asked how many previous visits they had made to the Water Conservation Garden. 38.3% of 107 respondents indicated that they had never been to the garden before, 24.3% reported 1-3 previous visits, 11.2% reported 4-6 previous visits, 8.4% reported 7-10 visits, and 17.8% said that they had visited the garden more than 10 times. Only 15.3% of 105 respondents indicated that they were members of the Garden, while 84.7% said “No.” When asked if they had ever participated in a program at the Garden, 24% of 115 respondents reported having attended a lecture and only 16.5% reported having participated in a class.

Motivation for Visiting

Survey participants were asked to rank the importance of several factors in their decision to make their most recent visit to the garden. Their responses are presented in Figure L.1 below. Owing to the potential ambiguity in the distinction between “Moderately Important” and “Somewhat Important,” these two categories have been collapsed and their cumulative percentages shown.

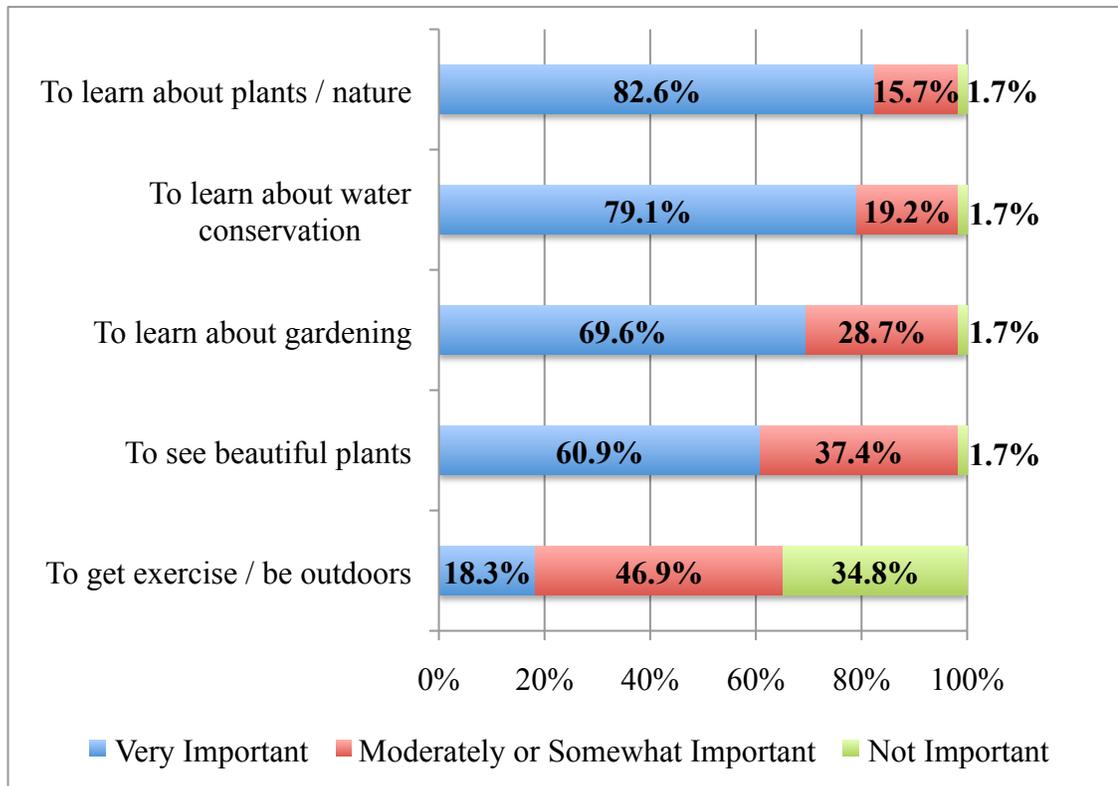


Figure L.1 The Importance of Various Factors in Motivating Respondents to Visit the Water Conservation Garden in El Cajon, California (N=115)