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Research paper

## Residential landscape aesthetics and water conservation best management practices: Homeowner perceptions and preferences

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## HIGHLIGHTS

- We examined aesthetic preference for whole landscapes and landscape components.
- Aesthetic preference takes precedence over other criteria, such as water use.
- Discrepancies exist between aesthetic preferences for components and whole landscapes.
- Aesthetic preferences for components imply inclination towards water conserving features.
- Responses for whole landscapes demonstrate preferences for fewer BMPs.

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## ABSTRACT

Up to 70% of residential water use goes to maintaining landscape plantings. With increasing water scarcity, changing the landscape preferences and choices of individual homeowners provides a crucial opportunity for water conservation. Using three demonstration landscapes varying in water conservation best management practices (BMPs), we surveyed attendees of a University of California Cooperative Extension educational event to determine preferences for the demonstration landscapes according to aesthetics as well as other preference criteria. The survey examined aesthetic preferences for BMPs at both the whole landscape level and the landscape component (turf, paving, non-turf vegetation) level whereas other preference criteria were examined only at the whole landscape level. Preference for the landscape with an intermediate amount of BMPs was the highest at the whole landscape level for nearly all criteria. Surprisingly, at the component level, homeowners exhibited preference for the more water conserving components. This indicates that BMPs are aesthetically appealing individually but when BMPs exist for every component in the landscape, the landscape is less preferred.

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## 1. Introduction

In California and much of the American West, water is a critical yet limited resource. Growing populations and climate change will only exacerbate this scarcity. As a result, water conservation is, and will continue to be, a crucial issue (McCammon, Marquart-Pyatt, & Kopp, 2009). Residential areas account for over 50% of urban water use (Gleick et al., 2003), and as much as 70% of that water goes to maintaining landscape plantings (McCammon et al., 2009; St. Hilaire et al., 2008). In addition, homeowners frequently apply more water than necessary to their landscape, which leads to substantial

runoff. Therefore, reducing landscape water use in residential areas is an important focus for water conservation efforts.

Water use in the residential landscape, however, is a cumulative result of the choices of many individuals. This poses a considerable challenge to conservation efforts. It has been estimated that residential water usage could be reduced by 33.5% using current technology if users were to make different choices (Gleick et al., 2003). In order to educate residents and promote water conserving choices, we need to understand how and why residents make the choices they do. To achieve this goal, we surveyed homeowners attending an educational event run by the University of California (UC) Cooperative Extension. The event was focused on water conservation Best Management Practices (BMPs) and offered participants the opportunity to view alternative plant and hardscape material choices for their landscaping and to talk with vendors about products designed to promote water conservation BMPs. The survey was designed to assess homeowner perceptions and

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preferences for different landscape choices based on aesthetics and a series of other preference criteria. While surveying homeowners for aesthetic preferences for landscapes has been done before, this study uniquely separates components of the landscape from the entire landscape in an effort to determine which components motivate overall aesthetic preferences. In addition, this survey was conducted at an educational event rather than by mail; participants could view the demonstration landscapes used in the survey and were assumed to be more receptive to BMP adoption than the general public because they were already attending the event.

### 1.1. Best management practices and willingness to adopt

A variety of best management practices (BMPs) have been developed to reduce landscape water use. Best management practices are design, management, and behavior guidelines and procedures that can either be included in new construction or retrofitted to existing parcels. There are two types of BMPs: (1) structural BMPs, which consist of infrastructure features that are permanent components of the landscape. This could include the amount and type of paving or physical components of the irrigation system, and (2) non-structural BMPs, which, in contrast, do not entail permanent changes to infrastructure and usually involve behavior modifications. For example, for a municipality, implementing non-structural BMPs may consist of applying regulations or educating residents about water conservation, while for the individual homeowner, non-structural BMPs may include modifications to the duration and frequency of irrigation and choice of plants. Although from an ecological perspective plants are considered part of the landscape structure, in this context they are not a permanent component of the landscape and therefore are not considered a structural BMP. For homeowners who wish to implement water conservation measures, non-structural BMPs are generally a more feasible option. Not only are these BMPs generally less cost and labor intensive to adopt, but also less disruptive to property. For example, programming irrigation to occur at night to minimize evapotranspiration is both less expensive and less destructive than installing water harvesting features.

It is uncertain, however, which factors influence whether or not a homeowner will adopt BMPs. Much of the existing research on BMP adoption by land managers has focused on agricultural systems, where the factors affecting management decisions are significantly different than in residential settings (Prokopy, Floress, Klotthor-Weinkauff, & Baumgart-Getz, 2008). In contrast to agricultural contexts, the look and feel of the landscape is an important consideration for homeowners. Several studies have found that aesthetics are often the primary focus of landscaping decisions, while environmental and other concerns are subsidiary (Fernández-Cañero, Ordovas, & Machuca, 2011; Larsen & Harlan, 2006; Spinti & St. Hilaire, 2004). Therefore, it is crucial to recognize the role that aesthetic preferences play in homeowner willingness to adopt BMPs and how important aesthetics are relative to other factors such as water conservation. In this study, we address this assertion by evaluating how people perceive and use their landscapes. Such understanding can be incorporated into the creation of novel water conserving landscapes designed to appeal to residents' aesthetic preferences. By including aesthetic preferences in the design of BMPs, the likelihood of adoption by homeowners may increase.

### 1.2. Factors influencing landscape preferences

While aesthetics is an important component of landscape preference, there are a variety of other factors influencing these preferences. Past research of personal preferences has investigated innate attraction to orderly, well maintained landscapes, cultural norms and social dynamics of landscape preferences as well as ways

of increasing knowledge and adoption of conservation practices (Nassauer, Wang, & Dayrell, 2009).

Landscapes which exhibit signs of being cared for (“cues to care”) are almost universally appealing (Nassauer, 1988; Nassauer et al., 2009). Although the particular cues are variable and culturally contingent, landscape features such as orderly plantings and well groomed lawns demonstrate that someone has invested time and effort into the landscape. Native plantings in contrast, are often perceived as messy or unattractive when they are used in urban settings (Nassauer et al., 2009; Williams & Cary, 2002).

The neighborhood context in which a landscape is situated also plays a role in shaping preference. As a result, residential landscaping is spatially autocorrelated, meaning that residents take the landscaping of their neighbors into consideration when making their own landscaping decisions, and, therefore, yards closer to each other will look more similar than yards farther apart (Zmyslony & Gagnon, 1998). Although there is a general trend to conform to the traditional suburban landscape stereotype of a lush green lawn, residents place a higher priority on maintaining the “look” or style of the landscaping in their immediate surrounding (Nassauer et al., 2009; Perez, 2010). The mechanism behind this clustering has been identified as “social contagion” or “neighbor mimicry,” in which residents imitate the landscaping of their neighbors, either due just to observation or to communication and exchange of ideas (Zmyslony & Gagnon, 1998).

Such increased familiarity with, and knowledge of, conservation strategies and alternative landscaping practices may lead to increased acceptance and adoption of them (Kurz & Baudains, 2012; Nassauer, 1993). To those who have knowledge of their regional flora and water conservation BMPs, a low water-use landscape of native plants can show the same signs of care and intention as conventional plantings and turf (Nassauer et al., 2009). A variety of pathways exist for dissemination of this type of information, such as television, radio, and newspaper advertisements, as well as brochures and handouts (Dietz, Mulford, & Case, 2009). Other methods, however, such as master gardener workshops and use of demonstration facilities, where visitors can observe how these BMPs look and function, have proven more effective at eliciting changes in homeowner behavior than media campaigns (Dietz et al., 2009; Swann, 2000). Just as seeing alternative landscapes in their neighborhood, demonstration facilities provide an experiential aspect that is central to increased adoption. An additional benefit is the ability of such facilities to help organizations and vendors customize information and outreach strategies to maximize effectiveness of their efforts.

### 1.3. Organizing framework and research goals

To organize the many factors which influence residential landscape choices, a management framework was proposed by Yabiku, Casagrande, and Farley-Metzger (2008). We draw on this framework to organize our investigation of aesthetic and other preferences for water conservation BMPs. Yabiku et al. (2008) propose that residential landscape choices are composed of four factors: (1) costs, (2) ecological constraints, (3) laws, and (4) personal preferences. Costs include the money and labor needed to install and maintain the landscape, including the cost of water. Ecological constraints are limitations such as average temperature, rainfall, or presence of diseases that restrict the types of plants available for landscaping. Laws may include state or federal regulations, but more often refer to the landscaping rules for homes governed by homeowners associations (HOAs). The ‘covenants, conditions and restrictions’ (CC&Rs) of HOAs can include everything from house color to the types of plants allowed in yards; some even specify the permissible height of grass in lawns. Personal preference is a complex category that is influenced by environmental attitudes,

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