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Exploring Symbolic Meaning in Landscaping Choices within a Desert City

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Executive Summary

Metropolitan Phoenix, Arizona, in the Sonoran Desert, provides an excellent opportunity to understand residents' preferences for desert-adapted xeric landscaping. While much is known about the relationships between sociodemographics and broad environmental values on xeric landscaping choices, the influence of other variables remains unexplored, especially interactions with and attachments to the desert. We therefore examined the influences of recreational visits to local desert mountain parks and symbolic meanings associated with the native desert on household xeric landscaping preferences. Within a larger study, select questions captured socio-demographics, visitation to desert parks and open spaces, place identity, and xeric landscape preferences. Using Ordinary Least Squares (OLS) regression, we confirmed that homeownership and a shorter residency predicted preference for xeric landscapes. Hispanics were less likely to prefer xeric landscaping. Interestingly, the novel factor of identity with the desert significantly and positively predicted xeric landscaping preference while visitation to desert parks and open spaces did not.

Findings provide several important management implications. First, Phoenix has an opportunity to foster connections with the surrounding environment through its extensive desert mountain parks. Increasing connections between residents and the parks may help shift personal preferences to xeric yard types. Park managers might also work to further stress how household decisions can affect the desert environment. Second, park visitation alone may not suffice to create connections with the desert environment. Instead, park managers should focus on creating opportunities for visitors to recognize the unique, living aspects of the parks and build personal relationships with the ecosystem. Interpretation encouraging emotional connections to the desert environment may aid in fostering an identity with the desert. In addition, messaging and signage campaigns that link people to the parks may prove a novel way of combatting lawn water usage within desert cities. Given their opportunities to foster place identity, urban parks may be important influencers in promoting native plant landscaping. In conclusion, connecting people to their surrounding environments can influence preferences for similar landscape types at the household level.

Keywords

Landscape preferences, place identity, symbolic interactionism, water conservation, urban ecology

Introduction

The Sonoran Desert, in the Southwestern United States, is an area of particular interest in the context of anthropogenic climate change. This unique ecosystem houses the greatest species diversity of any North American desert (National Park Service, 2017) and is one of the most likely to be negatively influenced by human behavior and presence (Agnew & Warren, 1996). The Sonoran Desert is also home to Phoenix, Arizona, the fifth most populous and fastest-growing U.S. city (Richardson, 2019). In a region with an eight-inch average yearly rainfall (National Climatic Data Center, 2017), Phoenixians average over 100 gallons of water use per capita daily (Arizona Department of Water Resources, 2017), compared to the national average of 88 gallons (United States Environmental Protection Agency, 2018). Given predictions of a warmer and potentially drier future, it is vital that urban areas cultivate low water use practices. Currently, around two-thirds of water use in Phoenix is residential, of which 74% is used for outdoor purposes (Balling & Gober, 2007; Mayer et al., 1999). Thus, one important step in achieving water conservation is the adoption of xeric or low water use landscaping at the household level.

Previous research on understanding landscape preferences in Phoenix has focused on socio-demographic factors such as income, residency, socioeconomic status, and broad environmental values and concerns (Larsen & Harlan, 2006; Larson et al., 2009; Larson et al., 2010; Larson et al., 2017; Yabiku et al., 2008). While desert visitation has received some attention (Larsen & Harlan 2006), its conceptualization requires refinement. Residential landscapes can serve as a symbolic representation of the self, warranting further exploration of the relationship between symbolic interactionism and residential landscape preferences (Larsen & Harlan, 2006). We expect that Phoenix residents' visitation to desert environs and symbolic attachments to the desert landscape may be important in determining landscape preferences. Since the influence of homeownership has also been understudied in the southwestern U.S., we examine its influence on xeric landscape preferences.

The purpose of this study is to expand upon previous work on factors influencing residents' landscaping preferences and investigate the influence of desert park and open space visitation and place identity on these preferences. We also examined the influence of socio-demographic factors and ecological worldview.

Literature Review

We begin with an overview of the landscape preference literature. Then, we discuss the yet to be studied influence of desert recreation and symbolic interaction with the desert. Next, the influences of the socio-demographic variables income, gender, education, residency, and homeownership are examined. We conclude with an exploration of the connections between ecological worldview and landscaping preferences.

Landscape Preference

Landscape preference research allows us to better understand individuals' choices in designing their land and what features are most important to them. The cultural and historical growth of lawns has led to lawns covering 10-16 million hectares of land in the U.S. (Milesi et al., 2005), accounting for about 25% of urban landcover (Robbins & Birkenholtz, 2003). The landscaping decisions of individual households can thus strongly impact water use. Xeric landscapes have arisen as increasingly common, low water use lawn alternatives. "Xeric landscaping" uses drought tolerant plants and crushed stone for groundcover (Larson et al., 2009; Martin, 2015). In Phoenix, these plants may include native species. In contrast, "mesic landscapes" are defined as turf grass yards (lawns) that require substantial irrigation. "Oasis landscaping" falls between xeric and mesic yards in terms of their desert-like nature and are characterized by a partial grass, partial rock mixed yard (Larson et al., 2009).

Desert Recreation

Some evidence suggests that landscape preference may be affected by attitudes toward, and interactions with, the environment (Kurz & Baudains, 2012; Purcell et al., 1994; Zube et al., 1986). Landscape preferences may vary by activity associated with that landscape (i.e., the landscape as a place to live, work, or vacation) (Purcell et al., 1994). In addition, people who have more positive attitudes toward native plants tend to prefer more native landscaping choices (Kurz & Baudains, 2012; Zube et al., 1986). Building on this, Larsen and Harlan (2006) explored the influence of engagement with outdoor recreational activities on landscape preferences. Contrary to expectations, engagement in outdoor activities did not influence landscape preference. Larsen and Harlan assumed that the recreation took place primarily in desert landscapes but did not explicitly ask whether the activity took place in the desert. Thus, there is a need to refine this question to ask specifically about desert recreation.

Recreation in an outdoor setting has also been found to be linked to attachment to that setting (Hwang et al., 2005; Kyle et al., 2003; Kyle et al., 2004) and it is common for people to bond with recreation places (Kruger & Jakes, 2003). These places can also hold sociocultural meaning (Williams & Carr, 1993). This echoes findings that most homeowners value their land as a symbolic representation of themselves (Larsen & Harlan, 2006). Given that residential landscapes may be a symbolic representation of the homeowner, by extension, it is logical to explore the desert landscape as a symbol of the self. The idea that landscapes can serve as a symbolic representation of the self may be understood through symbolic interactionism.

Symbolic Interactionism

The term symbolic interactionism (SI) was first coined by Herbert Blumer in 1937 but was preceded by years of largely unpublished discussion and work by individuals, such as George Mead (1962).

One of the central tenets of SI is that every person can create meaning through thoughts, actions, and interpretations (Gusfield, 2003). While sociodemographics may contribute to SI, people are not inextricably tied to their demographics (Gusfield, 2003). Given the symbolic nature of landscapes, it can be assumed that socio-demographic variables might not be enough to predict landscape preference. Despite some concerns with SI being unscientific or superficial, it has been acknowledged as legitimate and has resulted in a body of literature in a variety of fields (Stryker, 1987).

Given the individual creation of meaning described in SI, places become something beyond geography. Places create myth and identity (Crouch, 2000). This creation of emotions and identities can be tied physically to the material aspects of the place or intangibly as a representational symbolic meaning. The symbolic meaning does not require a person to be physically present (Crouch, 2000). Rather, an individual may draw meaning from a place based on what it represents for the individual.

The psychological construct of place identity (PI) builds on SI and describes the bond between an individual's sense of self and a place (Proshansky, 1978). PI has been defined as "...a subculture of the self-identity of a person consisting of...conditions about the physical world in which the individual lives." (Proshansky et al., 1983, p. 59). Compared with other "place" constructs, PI focuses not only on the physical setting, but the on the emotional and symbolic meanings of places (Hummon, 1992; Korpela, 1989; Kyle & Chick, 2005). PI often results from repeated use of a place (Bricker & Kerstetter 2000), but can also be more conceptual, resulting from meanings associated with symbolic places. This suggests that individuals whose identity is intertwined with the desert will by extension prefer a residential desert landscape.

Socio-Demographic Factors

The majority of landscape preference research has focused on the influence of socio-demographic factors. Income plays a role in residential landscape preferences; higher-income households are more likely to incorporate xeric and oasis yards while lower-income households tend toward mesic yards (Larson et al., 2009; Larsen & Harlan, 2006). However, the relationship may not be linear. Middle-income households are the most likely to prefer desert landscaping (Larsen & Harlan, 2006) and there is a weak connection between middle-income neighborhoods and high levels of receptiveness to initiatives aimed at increased native plant landscaping (Peterson et al., 2012).

The influence of gender has been mixed. Landscape preference may differ by gender (Abello & Bernáldez, 1986; Larson et al., 2009; Ode et al., 2009; Yabiku et al, 2008), with women more commonly preferring lawns. This may be because of traditional gender roles where women, as primary child caretakers, view xeric landscapes as dangerous to children (Larson et al., 2009; Yabiku et al., 2008). However, other studies have found no significant correlation between gender and landscape preference (Larsen & Harlan, 2006; Yu, 1995).

Education is mostly examined in conjunction with either income, race, or both, but most landscape studies do not include education in their analysis. However, education has been found to be positively related to natural landscape preferences (Buijs, Elands, & Langers, 2009). Similarly, while asked on questionnaires (Cook et al., 2012; Larson et al., 2009; Lyons, 1983), ethnicity has rarely been included in the analysis of landscape preference. One paper that did include ethnicity found no significant correlation (Larsen & Harlan, 2005). However, the conceptualization and definition of the ethnicity construct was unclear, making it difficult to draw conclusions.

Despite a regularly hypothesized positive relationship between residency and xeric preference, residency has either not been a strong predictor of landscape preference (Larsen & Harlan, 2006) or has been found to be negatively related to xeric landscaping (Hilaire et al., 2010; Larson et al., 2009; Larson et al., 2017; Martin et al., 2003; Yabiku et al., 2008). This aversion may be in part due to the legacy effect of high water use lawns and the promotion of Phoenix as an oasis (Hope et al. 2003; Larson et al., 2009). Historical campaigns that promoted 'doing away with the desert' may have strengthened long-term residents' preference for mesic lawns (Casagrande et al., 2007; Larson et al.,

2009; Larson et al., 2017). In fact, Phoenix residents were far less likely to prefer xeric landscapes when compared to individuals from other areas (Martin et al., 2003).

Homeownership is critical in understanding the ecological effects of landscaping preferences given homeowners' ability to create more sustainable urban landscapes (Breuste, 2004; Grimm et al., 2008). Homeowners have often been examined in landscaping research given their ability to more freely undertake landscaping decisions (Kurz & Baudains, 2012; Peterson et al., 2012; Wheeler et al., 2020). Homeownership has, however, rarely been explicitly connected to landscape preference (Kurz & Baudains, 2012). One study in Raleigh, North Carolina, found that renters were more likely than homeowners to prefer plant garden designs with no native plants (Peterson et al., 2012). However, this study did not explain the differences between homeowners and renters. The influence of homeownership in the arid southwestern U.S. has remained unexplored.

Ecological Worldview

Individuals who have a higher environmental concern are more likely to engage in environmentally friendly landscaping choices (Larsen & Harlan, 2006; Yabiku et al., 2008). In Phoenix, Yabiku et al. (2008) found that people with a preference for mesic lawns had higher anthropocentric values. Larson et al. (2010) found that individuals with an oasis yard were more anthropocentric than those with either mesic or xeric yards. Individuals with biocentric orientations opted for mesic yards and high levels of irrigation instead of the predicted xeric yards. Larson et al. (2010) speculated that this may be due to the multitude of ways that people define 'nature' in their life. Their findings provide a complicating view on how ecological worldview and xeric landscaping might be related.

Research Questions

In summary, recreation in the desert might influence landscape preference; however, rather than treating outdoor recreation as a proxy for desert recreation, desert visitation should be measured directly. Given the importance of the yard as a symbolic representation of the homeowner, PI offers an additional perspective for understanding landscaping preferences in the desert city of Phoenix. To date, no studies have linked identity with the desert and landscaping preferences. Given these gaps we ask:

How are resident's xeric landscaping preferences influenced by a) visits to desert parks and open spaces and b) symbolic meanings associated with these parks?

How are resident's xeric landscaping preferences influenced by socio-demographics and ecological worldview?

This study addresses these gaps by exploring the influence of desert park visitation and place identity on landscape preference. We also include the previously studied factors of income, gender, education, ethnicity, residency, homeownership, and ecological worldview.

Methods

Study Area

Phoenix, Arizona, is home to 1.6 million people and is steadily growing. About 65.9% of the population is white and 40.8% is of Hispanic or Latino origin (United

States Census Bureau, 2010). Mean monthly temperatures range from 67°F in January to 106°F in July. Average annual precipitation is 8.04 inches and the area experiences around 330 days of sunshine annually (U.S. climate data, 2018). Many of the historical housing areas were built between the late 1800's to the 1950's and maintain the legacy of high water use lawns (Larson et al., 2017).

Phoenix Area Social Survey

This study is based off a subsection of the 2017 Phoenix Area Social Survey (PASS) data collected via a residential survey by the Central Arizona-Phoenix Long Term Ecological Research (CAP LTER) Program at a southwestern university. The survey was administered by mail to 12 neighborhoods with a target of 65 respondents in each neighborhood.

Survey Design

PASS researchers selected neighborhoods to represent a wide range of income levels, ethnic profiles, housing development time frames, and locations across the metropolitan area. These neighborhoods represent only a sample of the Phoenix population and not the entire city. Each neighborhood is spatially defined based on census block groups.

Survey Administration and Incentives

The survey was administered by the University of Wisconsin Survey Center from early June through mid-August 2017. Surveys were mailed in four waves with reminders each month for uncompleted surveys. Survey collection ended on September 15, 2017. Respondents received a small incentive for participating.

Constructs and Variables

Landscape preference was measured using two questions addressing landscape preferences in the front yard and back yard. Respondents were asked to choose which of eight different landscaping options most resembled their front and back yard (see Larson et al. 2009). The eight landscape options were divided into four categories: (1) mostly or all grass (mesic), (2) a mix of both grass and gravel (oasis), (3) mostly or all gravel (xeric), and (4) patio, courtyard, and bare dirt (other). Only respondents that chose at least one of the first three categories for their front or back yard preference were included in the analysis given the study's focus on preferences for or against desert landscaping. Respondents who chose the fourth category for both their front and back yard preferences were excluded because their yards did not fall on the spectrum of desert landscaping.

Table 1
Frequency of Front Yard and Back Yard Preferences

		Back Yard Preferences			
		Mesic	Oasis	Xeric	Other
Front Yard Preferences	Mesic	18.6%	4.5%	0.9%	4.9%
	Oasis	6.7%	11.2%	0.7%	4.3%
	Xeric	5.2%	11.9%	14.8%	9.4%
	Other	2.9%	3.6%	0.7%	-

Note: Percent frequency of each combination of front and back yard preferences

Questions on income, gender, education, and homeownership were adapted from the U.S. census. Residency was calculated by dividing the number of years the respondent had lived in Phoenix by their age to determine what percent of their life they had lived in Phoenix.

Visitation at the parks was examined using two questions. The first asked how often the respondent visited desert parks and open spaces in the Phoenix metro area during the summer months and the second repeated the question for non-summer months. Both questions were assessed using a 5-point Likert scale where 1 was "Never" and 5 was "At least once per week or more".

Five PI items were adapted from William and Vaske (2003). The wording of these items referenced the desert parks, as these parks are where remnant urban desert land exists and are the best representation of the desert for most citizens. A composite place identity score was calculated using the average score across all five PI items. The PI scale had a Cronbach's alpha of 0.95 indicating a reliable scale (Gliem & Gliem, 2003).

Ecological worldview was measured using the updated New Ecological Paradigm (NEP) Scale (Dunlap et al., 2008). A factor analysis indicated that NEP was unidimensional. The score for each of the 15 items was averaged to create a single NEP score.

Analysis

Data were entered and cleaned in Statistical Package for the Social Sciences (SPSS v.23). Because the study explored the novel influence of place identity with the desert, differences between front and back yard were not considered. Therefore, landscape preferences for front and back yard were combined into four categories: 4 = xeric front and back yard, 3 = xeric and mesic, xeric and oasis, and xeric and other, 2 = oasis front and back, oasis and other, and 1 = mesic front and back, mesic and oasis, mesic and other. This maximized variability in the examination of parcel-scale landscape preferences.

An Ordinary Least Squares (OLS) regression tested the influence of the ten explanatory variables on landscape preference. Effect size was calculated and reported using Cohen's f^2 .

Results

Overall response rate was calculated as the number of completed and partial questionnaires (496) divided by the total sampled (1,400) minus the undeliverable or vacant addresses (140). The average response rate across all 12 neighborhoods was 39.4%.

Descriptive Statistics

Park visitation was significantly different between summer ($M=2.35$, $SD=1.25$) and non-summer ($M=3.11$, $SD=1.31$) months; $t(983) = -9.33$, $p=.000$. This was expected given the hot Phoenix summers.

Percentages for each landscape preference category are summarized in Table 2. Residents preferred mesic the most (38.2%), followed by xeric in combination with another landscape type (28.2%). Xeric in both the front and back was the least preferred landscape category (14.8%).

The mean score for each of the five items for PI are summarized in Table 3. Overall, respondents agreed that they identified with the desert (mean = 3.48). Few respondents (18.2%) disagreed or strongly disagreed that they identified with the desert. About half of respondents agreed or strongly agreed that they identified with the desert (50.8%).

Table 2
Residents Preference for Combined Front and Back Yard Landscape Categories

Combined Preference	Percentage
Xeric front and back yard	14.8
Xeric + mesic, xeric + oasis, xeric + other	27.1
Oasis front and back, oasis + other	19.7
Mesic front and back, mesic + oasis, mesic + other	38.5

Note: Percentages represent the portion of the respondents who indicated a preference for each combination of front yard and back yard landscape types.

Table 3
Mean and S.D. for Place Identity Scale

Item	Mean	S.D.
Place Identity	3.47	1.05
I feel the desert parks in the Valley are part of me	3.37	1.13
The desert parks in the Valley are very special to me	3.60	1.14
I identify strongly with desert parks in the Valley	3.37	1.13
I am very attached to the desert parks in the Valley	3.37	1.18
The desert parks in the Valley mean a lot to me	3.62	1.22

Note: Values indicate the mean score and the standard deviation across all respondents for the place identity items. The items were measure on a 5-point Likert scale where 1 = strongly disagree and 5 = strongly agree

Median household income was between \$60,001 and \$80,000. Female respondents made up 60.0% of the sample. Respondents were highly educated with 57.1% of respondents having a college degree or higher. Most respondents (74.9%) owned their house instead of renting (25.1%). There were also significantly more Non-Hispanic respondents (78.2%) than Hispanic ($\chi^2 = 187.28, p < 0.05$). However, this varied largely by neighborhood.

Model Results

Results of OLS analysis indicated that the ten predictors explained 17.0% of the variance ($R^2 = .170, F(10, 371) = 8.57, p < .001$, effect size = .240) (Table 4). Having a stronger place identity ($\beta = .151, p < .01$), being Non-Hispanic ($\beta = .167, p < .01$), and home-ownership ($\beta = .173, p < .001$) positively predicted xeric landscaping preference. Longer residency in Arizona was negatively related to xeric landscaping preference ($\beta = -.118, p < .05$). Summer and non-summer park visitation, gender, income, education, and ecological worldview did not significantly influence landscape preferences.

Table 4
Ordinary Least Square Analysis

	Xeriscape Preference		
	B	SEB	β
Place Identity **	.161	.062	** .151
Summer Visitation	.030	.054	.034
Non-Summer Visitation	.007	.055	.008
Ecological Worldview	-.052	.155	-.016
Household Income	.025	.020	.072
Education Level	.061	.037	.089
Hispanic **	.440	.140	** .167
Gender	-.080	.107	-.036
Residency *	-.414	.176	* -.118
Own/Rent **	-.438	.129	** -.173
Adjusted R2		.170	
Effect Size (Cohen's f2)		.240	

Note: Values indicate the results from the Ordinary Least Square analysis. * = significant at the $p<0.05$ level and ** = significant at the $p<0.01$ level

Discussion

Summary of Findings and Integration with Previous Research

This study sought to understand how Sonoran Desert visitation and symbolic meaning influence xeric landscaping preferences in metropolitan Phoenix. First, we refined and elaborated on the construct of desert recreation as conceptualized by Larsen and Harlan (2006). Instead of using outdoor recreation as a proxy for desert recreation, desert visitation was measured directly. Because of the extreme heat, summer and non-summer visitation were examined separately. Despite methodological refinements, the impact of desert recreation remained insignificant. This provides further evidence that visiting desert preserves is not a significant predictor of drought-tolerant, xeric landscape preferences.

Interestingly, symbolic interactions—conceptualized as identification with the Sonoran Desert—positively influenced residents’ preferences for xeric yards. Desert identity, previously untested in the landscape literature, adds to the understanding of how meanings attached to an ecosystem can influence landscape preferences in residential homes. Negative attitudes toward the desert result in a higher preference for grass in one’s own yard (Wheeler et al., 2020), indicating that the desert is important in understanding and influencing preferences for xeric landscaping. This finding is especially notable given that desert visitation did not influence landscape preferences in our study. As noted (Crouch, 2000), an individual may develop a symbolic meaning of a place despite not spending time there. While the relationship between desert visitation, place identity, and landscape preferences warrants further examination, this study provides evidence that the meanings associated with a place have implications for landscape choices.

This study also adds to European research on “socio**n**atures” (Swyngedouw & Swyngedouw, 2004). This field examines the social processes of fostering symbolic meaning with urban gardens. However, it focuses solely on built landscapes with little connection to natural environments. Our paper expands upon the work by connecting the symbolic meaning of personal spaces with the natural environment.

Outside of identity with the desert, three other variables were significantly related to xeric preference. The first of these was ethnicity. The model indicated that Non-Hispanics were significantly more likely to prefer xeric landscaping than Hispanics. While under-studied in the landscape literature, this finding follows previous conclusions that ethnic minorities may be less likely to engage in other environmentally responsible behaviors (Gan et al., 2004; Kepe, 2009; Sundberg, 2004). This is of particular interest given the large Hispanic population in the Phoenix area. A recent study found that Latino residents felt more negatively toward the desert, in part due to the perceived risks associated with high heat and other environmental desert hazards (Andrade et al., 2019), suggesting that social identity can shape attitudes toward arid landscapes. Although ethnicity acts as a proxy for culture and may not be fully representative, its importance in the model strengthens a need to explore how other meanings – including shared ideals and experiences among different cultures – can influence landscape preferences and management.

As predicted, residency was negatively related to xeric preference. This is in line with previous research done in the Phoenix area, where long-term residents were more likely to prefer mesic landscaping (Larson et al., 2009; Larson et al., 2017; Martin et al., 2003; Yabiku et al., 2008). As mentioned, this may be due to legacy effects (e.g., Larson et al. 2009).

Phoenix is an excellent example of how cultural and historical factors can shape residential landscapes. The pride of early Euro-American colonizers in overcoming the arid characteristics of the Southwestern U.S. is still apparent in Phoenix (Hirt et al., 2008). Given the water shortage facing the region, we suggest that in contrast to earlier campaigns, Phoenix booster programs, media, and conservationists should encourage embracing the desert environment and xeric landscaping.

Homeownership was also related to landscape preference. Homeowners were more likely than renters to prefer xeric landscaping. This study echoes the finding by Peterson et al. (2012) that renters are more likely to prefer non-native landscapes. Homeownership is a complex variable than can reflect preferences based on additional factors such as neighborhood norms (Larson & Brumand, 2014; Peterson et al., 2012), cultural and social norms (Bell, 2012; Larson et al., 2009), and governmental laws or ordinances (Yabiku et al., 2008). Though this study added to the understanding of how homeownership may contribute to landscape preference, more in-depth research is needed.

Homeownership may contribute to the disparity between landscaping preferences and landscape actualization. Preferences do not always match actual landscape types (Larsen & Harlan, 2006), and landscape choices may not be influenced by concerns about water scarcity (Larsen & Harlan, 2006; Larson & Brumand, 2014). A recent study in Phoenix found a similar mismatch between preferences and actual landscaping (Wheeler et al., 2020). Yard preferences were best explained by attitudinal characteristics while actual yards were more closely tied to structural drivers such as lot size and resident age.

The remaining four model variables—gender, income, education, and ecological worldview—were not significantly related to xeric preference. The relationship between gender and xeric preference has been inconsistent; some studies find a relationship (Abello & Bernaldez, 1986; Larson et al., 2009; Ode et al., 2009; Yabiku et al., 2008) while others do not (Larsen & Harlan, 2006; Yu, 1995). The relationship between income and xeric preference was contrary to previous literature (e.g., Larsen & Harlan, 2006) that found that affluence positively influences xeric preference. Despite previous findings (Larson et al., 2011), ecological worldview was not significantly related to landscape preference, suggesting that a general ecological worldview may not be specific enough to understand the social implications of desert environments. Given the disparity in findings across studies, further research is needed to determine a more complete understanding of the influence of all four variables on landscape preference.

Limitations and Recommendations

Our findings, while significant, have several limitations. First, given the novel nature of including symbolic meanings in landscaping literature, this study focused only on landscape preferences, not actual, realized landscapes. Even when people prefer xeric landscaping, they may not be able to implement it in their own household due to monetary or legacy effect constraints (Larson & Harlan, 2014). Understanding residents' preferences towards xeric landscaping will not help to conserve water unless those preferences can be translated into actual xeric yards.

Second, given the quantitative nature of the PASS, this study utilized place identity as a proxy for symbolic interactionism. Future studies should qualitatively analyze symbolic meaning by interviewing residents regarding their identity with the desert. This may also further elucidate the importance of non-visitation related attachment to the desert. Third, this study only used PI, which is one dimension of place attachment. This was decided given the limited space on the PASS and the more direct connection between PI and symbolic meaning. In the future, including additional dimensions such as place dependence will be illuminating. The final limitation was the focus on one specific environment and city. Given the central importance of Phoenix as a focus of landscape literature, future studies should utilize the foundation created from this body of work and apply it to urban areas across the world.

While this study focused on one city to test this novel relationship between PI and xeric preferences, the conclusions are applicable elsewhere, especially in desert cities. Other desert cities with similar social-ecological structures should consider addressing the importance of identity with the desert when implementing water-saving initiatives. That symbolic meaning with the desert can promote water-saving landscaping preferences should not be ignored by any desert city facing a water-shortage crisis.

Management Implications

This study has several implications for cities looking to integrate individual landscape decision-making with the management and ecological health of urban parks and preserves. Habitat fragmentation within urban areas is worrisome (Delaney et al., 2010; Theobald & Hobbs, 2002) and can lead to the loss of genetic diversity, inbreeding, and local extinction (Frankham, 2006; Reed, 2004; Reed et al., 2002). The isolation of the Phoenix desert mountain parks are excellent examples of ecological "islands" surrounded by urban development. Local park managers may be able to help maintain the health of public lands by promoting biodiversity corridors that link up the protected patches of habitat (Niemela, 1999). Front and back yards in residential areas can add

significantly to these corridors (Niemela, 1999). Therefore, urban parks and preserves may be able to contribute toward biodiversity corridors by promoting household native landscaping (Kurz & Baudains, 2012).

Given place identity's ability to increase native landscaping preferences, local land managers may be able to implement strategies that promote both water conservation and biodiversity corridors. By creating an emotional attachment with the desert parks, residents may become personally invested in water conservation in a way that policy alone cannot elicit (Inman & Jeffrey, 2006). Encouraging park use in a variety of different forms, such as volunteering and stewardship opportunities, may help to foster attachment to parks (Ryan, 2005, 2006). In addition, managers should design features that recognize user diversity, such as providing a variety of seating options, increased park activity through festivals and food vendors, and creating comfortable microclimates (Ryan, 2006).

Most importantly, managers should understand that visitation to the desert is not enough to promote xeric preference. A personal identity with the desert is necessary. Some people who frequent the Phoenix desert mountain parks may view the parks simply as opportunities for recreation and not as ecosystems. Therefore, park managers might create the most significant impact by stressing the opportunity visitors have to be part of the vitally important and unique surrounding ecosystem. Regardless of whether the managed ecosystem is a desert or a forest, showing visitors that each time they experience an urban park or preserve they are connecting to that living and breathing natural place may help to promote a personal connection.

To facilitate this process, urban park managers might consider providing more fee-free days. While fees are a necessary part of park management, fees can reduce visitation, public support, and exclude minorities and the economically disadvantaged (Anderson, 2001). If economically possible, local urban parks may consider offering more fee-free days throughout the year to allow typically underrepresented populations as well as new visitors the opportunity to experience the local environment. During these fee-free days, parks could also offer interpretation aimed at encouraging personal connections to the local environment. For desert cities, this might include a focus on the importance of water conservation and connections between ecosystem health and at-home water use choices. Future studies should explore how personal identity with the local environment may promote native-plant landscape preferences in other environments. It may be that connections to local environments are a universally important part of urban residents embracing native-plant landscaping preferences and their resulting ecological benefits.

If cities wish to embrace new sustainability models and preserve urban biodiversity in parks and preserves, managers must utilize every opportunity available to them. This study shows that connecting people with their surrounding environment at a symbolic level can help facilitate environmental changes that cities may wish, or need, to pursue.

Conclusions

This study demonstrates the importance of symbolic meaning in understanding xeric preferences in an urban, arid city. Importantly, place identity influences xeric landscape preferences and should be considered when designing water-saving initiatives in Phoenix and other arid cities. This effect may not be predicated on physical

interaction with a place since recreation in the desert is not enough to elicit xeric landscape preference. The study also adds to a growing understanding of how general socio-demographics influence landscape preference. Inconsistencies in sociodemographic findings among studies points to a further need to explore these complex social and economic variables. Future research should expand the field by considering lesser studied drivers of landscape preference while continuing to reveal how social and cultural meanings are associated to landscape choices and associated management practices.

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