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# Paradoxes in Landscape Management and Water Conservation: Examining Neighborhood Norms and Institutional Forces

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# Paradoxes in Landscape Management and Water Conservation: Examining Neighborhood Norms and Institutional Forces

With heavy water use and other inputs, residential lawns and traditional yard features result in resource consumption, pollution, and changes in biodiversity. Several studies have examined the driving forces behind landscaping practices, but few have examined how social institutions affect residents' decisions. We fill this gap by asking: how do formal and informal rules influence yard management, and how do these institutions interact in particular neighborhoods? Our interview-based case study is situated in Phoenix, Arizona, where outdoor irrigation constitutes a large portion of water demand. Overall, informal norms and customs at varying scales more strongly influence landscaping decisions than codified rules in our study. While residents appreciate diverse yard types, dominant norms involve pervasive expectations for neatness as well as varied plant choices grounded in historic traditions and personal experiences. Legacy effects and paradoxes concerning water conservation and urban homogenization also emerged from this research. Although insightful, these findings should be tested in diverse biomes to see how transferable they are across different contexts.

## **Keywords**

urban ecology; residential landscapes; lawns; social institutions; norms;

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## INTRODUCTION

Covering an estimated 1.9% of the continental U.S., turfgrass landscapes—often referred to as lawns—now blanket as much land as the top crops in the U.S. (Milesi et al. 2005). Lawns are particularly common in suburban and residential areas, where yards are managed through plant choices, water inputs, chemical applications (e.g., fertilizers and pesticides), and mowing and trimming. These land management practices contribute to social and environmental outcomes, both positively and negatively (Robbins 2007). On the up side, for example, lawns provide a green aesthetic and a comfortable landscape for recreation, in addition to potential stormwater benefits and cooling effects in urban environments. On the down side, they reduce biodiversity and typically require vast amounts of irrigation and other inputs, particularly to maintain grass in arid climates and to uphold the traditional expectation for a solid green, weed-free lawn (Larson et al. 2009; Milesi et al. 2005).

Because lawns are ubiquitous and have varying outcomes, and since residential land uses dominate cities, much research has been conducted on urban landscape management in recent years (e.g., Larsen and Harlan 2006; Nassauer et al. 2009; Robbins 2007). A recent review of the literature demonstrated significant work on topics such as water conservation behaviors as well as landscape preferences and attitudes (Cook et al. 2012). Meanwhile, although norms and policies are thought to be important drivers of landscaping practices, the empirical research to date lacks systematic attention to how social institutions of varying sorts influence land management in urban settings. Considering an array of norms and restrictions, we therefore inquire: how do institutions affect land management, and how do informal rules interact with formal ones—especially at the neighborhood level? With attention to multi-scalar drivers ranging from the household to broader scales (Cook et al. 2012; Roy Chowdhury et al. 2011), we follow Adger et al.'s (2003) approach to sustainable governance by analyzing both formal and informal institutions in specific social-ecological contexts (neighborhoods) of Phoenix, Arizona.

Employing interviews and other information sources, this comparative case study centers on three diverse neighborhoods in metropolitan Phoenix. Before detailing our methods and results, we first outline the conceptual and empirical background informing this study. In the end, we illustrate the central role of informal norms, customs, and traditions—operating at multiple socio-spatial scales—as drivers of landscaping decisions and outcomes in arid Phoenix.

## INSTITUTIONS AND LANDSCAPING DECISIONS

Social institutions are defined as the rules governing peoples' actions and interactions (Adger et al. 2003; Ostrom 2011). *Formal* institutions include codified laws, policies, and mandates, whereas *informal* institutions encompass unwritten norms, expectations, and customs. Both sets of institutions influence individual and societal decisions, as people are guided by varied intentions, pressures, and constraints at different geographic scales (Adger et al. 2003; Cook et al. 2012; Roy Chowdhury et al. 2011).

## **Formal Institutions: Neighborhood and Municipal Rules**

Codified and enforceable rules potentially motivate or constrain landscaping decisions at the neighborhood, municipal and broader government scales (Cook et al. 2012; Roy Chowdhury et al. 2011). Specifically, residents may be constrained by neighborhood codes or municipal ordinances (Robbins 2007).

At the neighborhood scale, homeowners' associations (HOAs) have the authority to enforce Covenants, Codes, and Restrictions that govern local areas (Larson et al. 2008). Covenants can include everything from restricting paint colors to requiring landscape elements. While their main goal is to promote social goods in a neighborhood (Turner and Ibes 2011), HOAs have been critiqued for promoting homogeneity in housing, landscaping, and social characteristics (e.g., race, wealth; Kennedy 1995). Because HOAs have the authority to control public features of residential areas, it seems that HOA-governed neighborhoods are more likely to be similar or homogenous across households compared to non-HOA ones.

Few studies have empirically examined the role of HOAs in landscaping decisions (Cook et al. 2012). Previous research in Phoenix has shown that areas with HOAs, which tend to be newer, have a greater portion of desert-like 'xeric' landscaping (as opposed to 'mesic' turfgrass or an 'oasis' mix of groundcover)— compared to areas without HOA rules (Larsen and Harlan 2006; Martin et al. 2003). In a more detailed, preliminary study of HOAs in Phoenix, researchers found that yard maintenance (i.e., encroachment, plant height, weeds, other pests) was most commonly controlled by HOA restrictions, followed by water flows (i.e., drainage, topography, irrigation) and species composition (i.e., for grass and other vegetation) (Larson et al. 2008). While some HOAs restrict grass or certain plants (e.g., due to organic litter or allergy problems), others require particular vegetation types (e.g., for aesthetic reasons).

Regarding government institutions, specific rules commonly take the form of maximum length standards for grass, which tend to be established by municipal (city or town) health boards or state-level environmental departments (Robbins 2007). Such ordinances aim to avoid nuisances, hazards, and pests (such as fire and rodents) due to 'over-grown' vegetation. For reasons ranging from public safety to water use and drainage, formal rules also potentially require vegetation (e.g., to prevent erosion) or prohibit it (e.g., to conserve water). Some towns even ban or limit water use directly (Vickers 2006). In addition to restricting or regulating plants or irrigation, some municipalities (especially in Canada and the U.K.) have recently started to ban or regulate pesticide use (Hirsch and Baxter 2009) or fertilizer applications (Lehman et al. 2009) for public health and/or environmental reasons (Robbins 2007). Yet since such restrictions require enforcement to be effective, and since dispersed decisions among numerous households are difficult to monitor, informal rules often have profound impacts on people's choices (Ostrom 1990; 2011).

## **Informal Institutions: Norms and Customs at Varying Scales**

Social norms and customs that operate through personal beliefs and social pressures require people to interpret values and ascribe meanings in order to make decisions about what is socially

desirable and culturally appropriate (Adger et al. 2003). Though they are typically harder to assess than formal rules, informal institutions (such as norms) are common (Ostrom 2011).

Two categories of norms include descriptive and injunctive beliefs (Schultz et al. 2007). Descriptive norms represent beliefs about what people do, or in other words, the typical patterns of social activities and choices. The “Industrial Lawn” is the dominant norm in America yard-care, with notions of single-species (monocultural) lawns that are kept weed-free and super-green through the use of pesticides and fertilizers (Bormann et al. 2001; Robbins 2007). However, with diversified lifestyle tastes as well as social and environmental concerns about the water and chemical inputs used to maintain lawns, alternatives are on the rise—for example, ‘xeric’ (dry) yards that require less water (e.g., with rock groundcover; Larson et al. 2009) or more naturalistic landscapes that mimic the local environment (e.g., with native vegetation that is now mowed or trimmed; Nassauer et al. 2009).

While descriptive norms entail what people think is standard practice, injunctive norms involve judging the un/desirability of specific actions (Schultz et al. 2007). A common injunctive norm is the desire for neat, orderly landscapes, which represent signs of “neighborliness, hard work, and pride” (Nassauer 1995: 162). The norm of neatness derives historically from a desire to control or dominate nature (Tuan 1974). As Saarinen (1976) describes, American landscape preferences have been driven by perceptions of expansive “wild” places that are “empty, formless and unfinished, and subject to violent extremes” (195). By extension, landscapes are seen as “something to be tamed and made useful.” More broadly, western traditions underscore landscapes that are “settled and comfortable” (Saarinen 1976: 195).

Nassauer (1995) put forth a broader notion of landscape management as “sociable human intention” (162). This view sees neatness not only as a function of domination and control, but also as a matter of involvement with and accommodation of nature (Nassauer 1988). Ultimately, neatness is expressed and experienced as caring (e.g., for land or family, neighbors or others) such that conservation could become part of socially desirable landscape intentions. However, since people tend to prefer more manicured landscapes over “messy” and “disorderly” naturalistic ones (such as wetlands or tall grass), designing landscapes with “cues of care” (such as mowing, edging, and pruning)—regardless of the type—is essential for sustaining their social and ecological value (for more on this approach, see Nassauer 1995 and Nassauer et al. 2012). Over time, this could lead to changing expectations for landscapes, including those that conserve natural resources or enhance biodiversity.

Robbins (2007) describes how conventional lawn management often invokes positive norms reinforced by feelings of social status, cohesion, and responsibility to neighbors. On the other hand, landscapes that are not trimmed or well-maintained, or are weedy or junky, symbolize neglect or disregard (Nassauer 1988; Robbins 2007). Poor lawn care, therefore, is a sign of poor character and a failure to meet social obligations, which can lead to negative emotions (such as anxiety or stress) about yard management.

Norms imply social obligations to act as well as expectations to conform (Stern 2000). Beliefs about how to behave can be internal, as in personally held views about how people (themselves or others) should act. Norms can also be external, such as social expectations or

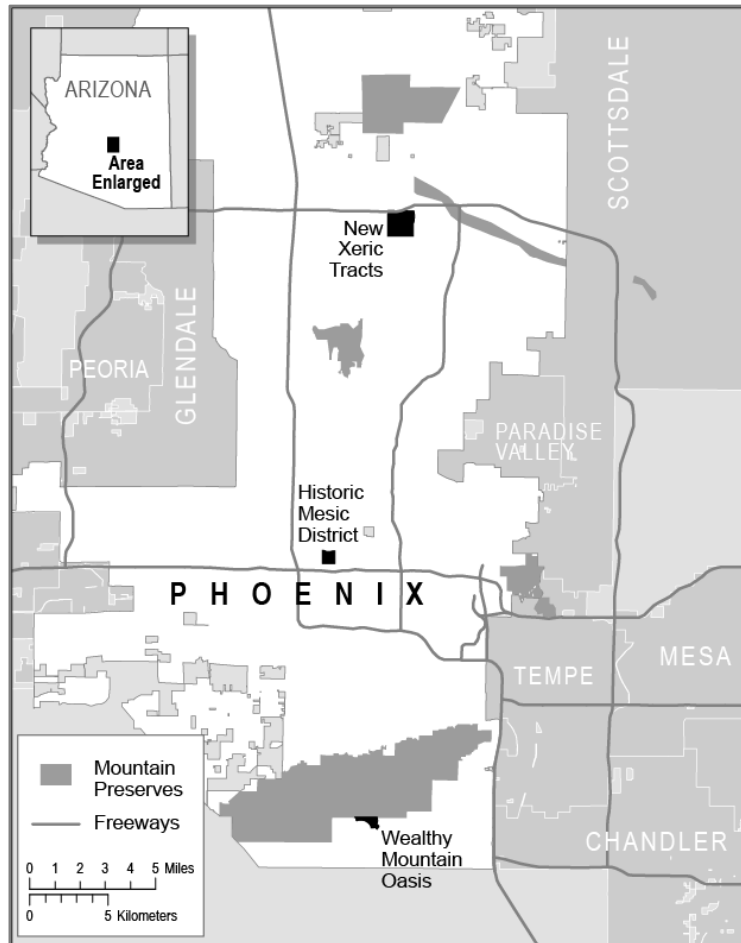
pressures imposed by others. Regarding ascription to landscaping norms in particular, several important reference groups exist including household or family members, neighbors, and landscape professionals and service providers. Within households, both familial traditions and gender dynamics play into personal norms (Larson et al. 2009; Yabiku et al. 2008). As a whole, landscapes are imbued with memories and meanings, and thus, their appreciation depends on personal experiences and social interactions in particular contexts (Tuan 1974).

Place-based affiliations as well as social and cultural customs affect landscaping preferences and expectations at the neighborhood, regional, and broader scales (Nassauer et al. 2009; Larson et al. 2009). At the neighborhood level, landscaping dynamics can vary depending on historical, environmental, and social context (Larson et al. 2010). In a Michigan study, the landscapes of nearby neighbors most strongly influenced local yard designs, yet broader cultural norms favoring a traditional lawn were also somewhat important for front-yard choices (Nassauer et al. 2009). This study suggests a strong neighborhood effect on landscaping, especially where strong local norms exist. Another study in Phoenix found neighborhood effects for land cover (grass versus alternatives), which in turn structured inputs (such as pesticide use; Larson et al. 2010). In the Phoenix region, historic customs and the modern-day material landscape—which has been transformed through irrigation and development over time—have produced an ‘oasis mentality’ that permeates the minds of long-term residents who have become accustomed to lush, watered landscapes. Evidence of this is born in the fact that longer term residents of Phoenix have stronger preferences for lawns than relative newcomers (Larson et al. 2009).

Overall, the critical role of place-based studies and multi-scalar dynamics (Roy Chowdhury et al. 2011) compel comparative, case study approaches to fully understand how various institutions affect yard management across diverse settings. While we compare distinctive neighborhoods in Phoenix, future work should examine landscaping practices and social institutions across different cities, regions, and nations.

## **METHODS**

Our case study relied primarily on interviews, which were supplemented with information from published or online information and phone calls with city officials. Co-located with other studies in a long-term research project, the three neighborhoods (Figure 1) across the City of Phoenix were purposively chosen because of varied landscapes. This includes an older downtown neighborhood—the Historic Mesic Palms—and two fringe neighborhoods located around the edge of the City of Phoenix—New Xeric Tracts and Wealthy Mountain Oasis (Table 1). As their names imply, these neighborhoods are dominated by relatively lawn-dominated (mesic), rock-based (xeric) and a mix of both (oasis) landscapes (Figure 2). The wealthy oasis neighborhood (median household income of \$107,230 around the time of the study) and the middle-class xeric neighborhood (\$59,375) have HOAs, while the mesic area (\$77,404) does not.

**Figure 1.** The Study Neighborhoods in Phoenix, Arizona

Using a purposeful, stratified sampling design, interview participants from each neighborhood ( $n=4$ , for a total of 12) were selected to represent a diversity of yard types, chemical-use patterns and demographics. A survey conducted in 2008 allowed us to characterize these factors. The previous survey also asked respondents to indicate if they might be willing to meet with us in the future for an interview. For the interviews used in this study, we only selected participants who said “yes” or “maybe” on the 2008 survey. We then targeted interview participants based on reported responses about landscaping characteristics and management practices: first to represent yard types in the area (i.e., mesic, xeric, oasis), and second, pesticide and fertilizer usage (i.e., relatively low to high chemical applications). Demographics were also considered as a third criterion for diversifying our sample (e.g., by gender; see Table 1).

The interview protocol employed a semi-structured format to probe residents about their yard management. Specifying the institutions described earlier (see also Table 2), we asked residents about their landscape preferences and management practices. This involved questions about personal and household choices as well as neighborhood and broader regional and social influences. Interviews lasted about an hour each, after which two student researchers did a walk-through tour of both the front and back yards. The field assistants also took notes on each

household’s landscape types (e.g., all or mostly grass was classified as mesic, all or mostly rock as xeric, and a mix of both as oasis; see Table 1). The interviews were digitally recorded and transcribed for analysis.

**Table 1.** Yard Types and Demographics for Interviewees in Study Neighborhoods

<b>ID No.</b>	<b>Front Yard</b>	<b>Back Yard</b>	<b>Interviewee(s) Gender</b>	<b>Residency at Home</b>
<b><i>Historic Mesic District</i></b>				
179	Mesic lawn (mostly)	Mesic lawn (all)	F	12 years
186	Mesic lawn (mostly)	Mesic lawn (mostly)	M	8 years
151	Mesic lawn (all)	Xeric Rock (mostly)	M & F	26 years
178	Xeric Rock (all)	Xeric Rock (all)	F	18 years
<b><i>Wealthy Mountain Oasis</i></b>				
463	Mesic lawn (mostly)	Mixed Oasis (pool)	M & F	18 years
391	Mixed Oasis	Mixed Oasis (pool)	M	5 years
451	Mixed Oasis	Xeric Rock (mostly)	M & F	19 years
462	Xeric Rock (mostly)	Mixed Oasis (pool)	M & F	17 years
<b><i>New Xeric Tracts</i></b>				
331	Xeric Rock (all)	Mixed Oasis (pool)	F	9 years
253	Xeric Rock (all)	Mixed Oasis	M	16 years
300	Xeric Rock (mostly)	Xeric Rock (mostly)	M	8 years
262	Xeric Rock (all)	Xeric Rock (all)	M	10 years

**Figure 2.** Characteristic Landscapes in the Case Study Neighborhoods





**Table 2.** Summary of Findings: The Number and Nature of Informants' Comments on How Institutions Affect Landscaping Practices

Institutions	Historic Mesic District	Wealthy Mountain Oasis	New Xeric Tracts
<i>Formal Rules and Actions</i>			
<b>Homeowners' Associations Rules</b>	<b>0 informants</b> <i>No HOAs</i>	<b>1 informant</b> - Rules on housing details, not yards; lack of awareness on specifics <sup>1</sup> (1) - Some restrictions for overgrown plants; warning for tree encroachment (1)	<b>1 informant</b> - Weeds monitored on irregular basis; not much enforcement (1) - Lack of awareness <sup>1</sup> (1)
<b>Neighborhood-based Municipal Overlays</b>	<b>2 informants</b> - Historic overlay mostly deals with housing, plus palm trees (1) - City maintains street palms <sup>2</sup> (1)	<b>0 informants</b> <i>No historic overlay district</i>	<b>0 informants</b> <i>No historic overlay district</i>
<b>Local (Phoenix) Ordinances/Actions</b>	<b>2 informants</b> - Weed ordinances exist <sup>1</sup> (1) - County sprays for mosquitoes, plus weak watering standards in city (1)	<b>1 informant</b> - City does weeding/maintenance around public areas in neighborhood (1)	<b>2 informants</b> - City sometimes removes plant litter in common areas (1) - Weak conservation policies compared to Tucson <sup>3</sup> (1)

*Notes:* This table describes all interview comments reflecting the drivers of landscaping decisions for each study neighborhood. Numbers in parentheses are for how many informants commented on specific issues. Superscripts also signify where: <sup>1</sup>Informants demonstrated a lack of awareness of specific HOA rules and municipal ordinances governing landscaping practices overall. <sup>2</sup>A lack of funding has diminished the city's tree maintenance, according to personal communications with local officials. <sup>3</sup>The City of Phoenix does not currently have water-use bans or other types of restrictions on yard irrigation through formal powers.

**Table 2.** Summary of Findings (cont.)

<b>Institutions</b>	<b>Historic Mesic District</b>	<b>Wealthy Mountain Oasis</b>	<b>New Xeric Tracts</b>
<i>Informal Norms and Traditions</i>			
<b>Household Preferences Expectations</b>	<b>4 informants</b> - Front yard public (1) vs. back yard private leisure (3), especially kid-friendly (1) & cool/shady (1) -Whole city should conserve water (2), but not all green spaces should suffer; still room for landscaping (1)	<b>4 informants</b> - Front curb appeal (1) vs. back yard for private leisure (2) & outdoor living (1) - Spousal pressures & negotiations for plant types (2) - Need for water conservation, but do not want to change habits (1)	<b>4 informants</b> - Front yard for property values (1) vs. back yard for private leisure (2), especially reading & relaxing (1) - Want to conserve water (2): no landscaping in back (1); drought-tolerant plants & rock cover (1)
<b>Neighborhood Pressures</b>	<b>4 informants</b> - Lush landscaping (3), especially nbhd. park (1) & history (2) -Pressure to have common lawn (2) - Yards should be neat & well-maintained (4)	<b>4 informants</b> - Mixed landscapes appreciated, especially for overall look of nbhd. (3) - Yards should be neat & well-maintained (4)	<b>4 informants</b> - Nbhd. values water conservation (3) - Maintain characteristic landscapes to match look of nbhd. (3) - Yards should be neat & well-maintained (4)
<b>Regional Customs (Phoenix)</b>	<b>3 informants</b> - Historic promotion (3) - Park central to local character (2)	<b>1 informant</b> - Phoenix landscaping not uniform across region; no sense of city character (1)	<b>3 informants</b> - Water conservation important to longevity of entire region (3)
<b>Broader (U.S.) Traditions</b>	<b>3 informants</b> - Match hometown landscaping despite local desert conditions (3) -Hire landscapers (3) to keep it neat (2) & due to heat (1)	<b>2 informants</b> - Match hometown landscaping despite local desert conditions (2) -Hire landscapers to maintain yard (3), plus save time (2) & effort (1)	<b>2 informant</b> - Hard to maintain plants in desert (1) - Tucson has stronger water ethic (1) - Initially hired landscapers to lay foundation for yard (1)

Transcripts were analyzed deductively (following the literature review and the left-hand column in Table 2) for the driving forces in residential yard management. First, a student-professor team reviewed transcripts to iteratively assess and summarize all the ways in which residents invoked institutions in talking about their yard choices and practices. We then looked for common themes and notable differences among the study neighborhoods, focusing on the homeowners' evocations of formal and informal institutions. Attention was also placed on locally specific interactions and contexts. As such, and due to our small sample size, we cannot generalize our results to other places or populations. Nevertheless, our findings are instructive and they also resonate with previous research in other areas or with broader samples.

## RESULTS

In this section, we first report on formal and informal institutions at various scales. Next, we describe the interaction between institutions in each study neighborhood. Exemplary and illustrative quotes are presented throughout, with the neighborhood and identification numbers in parentheses (see Table 1).

### Formal Institutions

#### *Neighborhood Rules and Organizations*

Based on our interviews, Homeowners' Associations do not strongly influence residents' everyday yard decisions in either HOA neighborhood we studied (Table 2). When asked, research participants were largely unaware of exactly what their HOA stipulates for yards. However, one resident did mention receiving a warning for tree encroachment:

“We’ve been cited once because our trees got too overgrown and they told us that we needed to cut them and if we didn’t, we’d get penalized, which upset me a little bit because we’re very conscientious about taking care of our yard so when we get cited it’s offensive...” (oasis 462).

Among our study neighborhoods, HOA codes appear to dictate housing details more so than landscaping characteristics. This is also the case in the non-HOA mesic neighborhood, where a municipal overlay and local organizations (including a neighborhood association and historic preservation society) aim to maintain the area's historic character. As one resident described: “[The historic society] only [has] control over one thing, it’s the exterior of the building...” (mesic 186). Residents of the Historic Mesic District also noted:

“We have an association that takes care of the community garden and plants flowers” (mesic 151).

“[The preservation association] is concerned about making sure that the neighborhood stays cohesive and is recognized by the city” (mesic 179).

The same local resident who heralded the cohesiveness of the community eschewed HOAs for fostering homogeneity: “[HOAs] are inventions of the devil... I have a friend who lives in one of those and every house looks exactly the same, every yard looks exactly the

same... How sad, how truly, truly sad” (mesic 179). Yet, paradoxically, landscape homogeneity (especially grass cover) exists more so in the non-HOA neighborhood than the HOA-governed ones due to residents conforming to the legacy of lush lawns and palm trees.

In addition to voluntary groups who promote the landscapes of the past, the city-enforced ordinances in the Mesic District specifically prohibit the cutting down of palm trees that line the streets. City workers also maintain the palm trees, or at least they have in the past. As one resident noted: “[The city] would come in every year and take care of all of the palm trees here, but the budget cuts just killed it so now every homeowner takes care of that” (mesic 186).

In short, formal neighborhood rules—especially in HOA-run communities—do not strongly influence yard decisions among our study sample. Instead, historic customs—reinforced by voluntary groups as well as city ordinances and practices—result in landscape homogeneity in the non-HOA area in our study.

### *City-Wide Rules and Practices*

Some informants discussed municipal rules in terms of general programs or comparisons with other cities, but most participants were unaware of regulations dictating their yard management. Most participants did not reference government ordinances or programs in explaining their landscaping practices, but a few commented when explicitly asked (Table 2). In particular, residents mentioned local rules about pest management, with one each referring to weeds and mosquitoes.

“Certain practices can be against code like when people’s weeds get too high and become a fire hazard, but there’s a lot of gray area still” (xeric 331).

“I’m next to water at [the park], there were a lot of mosquitoes... The county...sprays the air...and I think that’s what’s making me sick” (mesic 178).

Indeed, the City of Phoenix governs its jurisdiction (including all three study neighborhoods) through municipal codes that require residents to maintain their landscapes for public safety, for example, by preventing weeds or grass from growing above six inches in height in order to prevent hazards such as fires (City of Phoenix 2009). Additionally:

“It is unlawful for any person to allow trees, shrubs or bushes growing on their property to interfere with traffic signs or signals, or with the passage of pedestrians, bicyclists, vehicles, or flow of drainage water on any public right-of-way or easement.”

Yet even the resident who mentioned weed ordinances knew little about their specifications, and according to city officials, most citations occur in response to complaints by neighbors (City of Phoenix 2011). The City also sends out employees to check for overgrowth and other violations, especially where foreclosure rates are high and on public land (e.g., parks).

The City of Phoenix also prohibits certain kinds of olive and mulberry trees due to pollen and allergy concerns. In order to conserve water, the city encourages (but does not require) residents to plant low water-use landscaping that “reflects and enhances the image of the Sonoran Desert” (City of Phoenix 2009). Yet none of the residents interviewed commented on

these municipal ordinances or conservation programs in Phoenix. A couple of interviewees did mention the relatively lax water standards in the City (Table 2). For example, one informant who grew up in Tucson said: “Tucson is a much more water conscious city than Phoenix. We need to get better about water management [in Phoenix]... but there is room in a water conscious world for a little bit of green space” (mesic 151).

Though Phoenix does not restrict water use or ban irrigation, the City does have an ordinance that prohibits residents from allowing water to run off into the street while irrigating their yards. This ‘wasteful water’ ordinance does not seem highly enforced as none of our interviewees mentioned it, and when asked, city officials explained they mostly give citations for large water discharges (e.g., by businesses). The city official also elucidated that draining pools into sewer systems is against code, but again, such ordinances are only reprimanded or enforced when residents report violations (City of Phoenix 2011).

In sum, even though some municipal ordinances and actions exist for vegetation choices and maintenance, water conservation, and pest nuisances, residents appear largely unaware and unmotivated by these rules. Local government entities also take some direct actions to address nuisances and complaints, but enforcement and resources to do so are limited.

### **Informal Institutions**

In contrast to formal rules, historic customs and social expectations seem far more influential to residents’ landscaping decisions among our study sample.

#### *Household Social Norms and Expectations*

Social pressures were strongly invoked through injunctive norms, as all informants across neighborhoods stressed expectations for well-kept yards (Table 2). Exemplary quotes emphasize the desire for neat, manicured landscapes:

“Keeping yards neat, I think is the most important thing. I mean, when people talk about houses, that I’ve heard, it’s usually about the foreclosures looking bad. Some of those yards look messy and there are a bunch of overgrown plants or weeds” (mesic 186).

“There is an expectation [for yards] to be clean, neat, trimmed... They shouldn’t have dead plants out there. They shouldn’t have trash out there” (oasis 451).

“People don’t have to be totally into [their landscaping] and spend a lot of money. Just groom it. Make it look halfway appropriate” (xeric 331).

While all residents interviewed stressed expectations for well-maintained yards, only two mentioned a particular kind of groundcover they preferred or expected of others. The following quotes demonstrate tolerance and appreciation for diverse landscape types.

“Phoenix has such a variety of neighborhoods and different kinds of landscaping. I really like going from one part of town where it’s lush to another where there are some beautiful cactus gardens. We do have a little bit of that here. Most people keep lawns, but we do have some nice variety” (mesic 151).

“I think it’s just nice to have different things in everybody’s yard. I mean, it wouldn’t look good if everyone had just gravel or over-seeded lawns. I like the variety” (oasis 463).

“I like that the landscaping here is fairly diverse. People use all different kinds of plants but I think for the most part they keep it low water” (xeric 262).

Spousal pressures and conflicting views also influenced residents’ plant and landscaping choices in our study. Illustrative quotes include:

“We have a tree in the backyard, a ficus tree, and I hate it. It’s ugly and it’s messy. I only keep it because my wife likes it. I guess I’m kind of stuck that way” (oasis 462).

“My wife really likes flowers, which is why we have a bunch of pots around the front and back of the house. It’s what she does for fun. She really likes flowers” (xeric 331).

While social influences within households can be important, economic costs and neighborly pressures also constrain landscape choices or changes. As one interviewee noted: “My wife and I would like to use native desert plants, but it costs so much to change over. We just don’t have enough money to do that.” (mesic 151). In front yards, residents viewed landscapes as public spaces and felt obligated to maintain property values and the look of their neighborhood. For instance:

“I really don’t do much with the front yard. I keep things neat and trimmed, but otherwise it’s basically been the same plants since we moved it. It’s just something we have to maintain because it came with the house. We spend our time in the backyard if we’re outside so that’s where we invested” (mesic 186).

“The front yard is really just about keeping things similar to the rest of the neighborhood. There’s not any really room for creativity. That’s why I love my backyard, it’s all mine” (oasis 451).

“I think the front yard is mostly important for property values. I know I keep my front yard better than I do my backyard because it keeps property values higher. I mean, would you want to move into a place that looks like no one cares about their front yards? It would be less appealing” (xeric 262).

Nearly half of our informants expressed concerns about water conservation in their yard management; however, some residents reportedly still use a significant amount of water, in part because they are not willing to give up certain landscape features (e.g., grass; see Table 2). Exemplary quotes about conservation follow.

“Phoenix needs to get better about water management, but to me that doesn’t mean scraping off everything green and putting out a plant that bites. ...There is room in a water conscious world for a little bit of green space” (mesic 151).

“I’d like to conserve water, because living in the desert, we need to be aware of our water habits, which is why we only have grass in the back yard. Even though it would use less water to go with all desert landscaping, we spend a lot of time

out there and it's really not as pleasant to have a bunch of desert plants out there to maneuver around when we're out with the grandkids" (oasis 462).

"...15 or 20 years ago it was a big deal down here to conserve water, it's still a big deal, but, you heard more about it then, so a lot of people like myself put in low water use plants and drip systems rather than sprinkler systems" (xeric 253).

In sum, personal expectations and social pressures dominate yard choices, especially plant types. While preferences range from "desert plants" to "a nice green yard," informants across neighborhoods appreciate, or at least accept, a variety of yard types so long as they are neat and tidy. Several residents also expressed expectations for water conservation in the desert, yet many still irrigate lawns and plants. For many, preferred landscape features (e.g., certain plants, lawns) and social pressures (e.g., spousal preferences) trump conservation concerns.

### *Neighborhood Pressures and Expectations*

In interviews, several residents referenced their local environments—whether urban parks with lush landscaping, desert areas with xeric plants, or somewhere in between (Table 2). Some also felt pressure to maintain their landscapes in certain ways, especially as they observe others making changes or managing yards in certain ways. As one interviewee said, "We're living in a desert so it only seems right that we treat it like we are. I've taken out my lawn in the back, but a purely desert landscape would look out of place in the front yard on our street" (oasis 451). For the most part, social norms seem to be internalized personally rather than exerted outwardly toward others. For instance:

"We've never really had much grass in this neighborhood since I've been here, but it does seem like there are some people adding more rock features and patios around. I'm not really into that and there hasn't been any direct pressure" (xeric 262).

"I only felt pressure to change my yard when I saw the others on my street remodeling their houses. Some of them took out some of their grass and added some masonry, but I haven't done anything yet" (oasis 463).

"My neighbor next door wasn't happy about a bunch of leaves in my yard at one time... She just told a friend of mine that she didn't like it. So my friend told me. I know she also doesn't like that I have arid landscaping when virtually everyone else on this street has grass" (mesic 178).

Although some residents do react to their neighbors' yards in evaluating their own choices, informants in the Historic Mesic District expressed the most pressure to conform to the dominant yard type locally—that is, lawns. Three of the four informants in this area invoked the importance of maintaining the historic character of the neighborhood landscaping, as in:

"[The landscaping] is all original to the houses. These are all historic properties so that's a commitment you make when you move into a historic neighborhood. You...don't move here unless you appreciate where you're moving" (mesic 179).

“We are in a city park environment and so I think that if you stay and respect the fact that it’s a city park that’s the natural environment here. If you respect that that’s what you’re going to have in your yard” (mesic 186).

One resident in the mesic neighborhood—whose xeric landscaping did not match the dominant trend—commented:

“Everyone in the neighborhood pretty much believes in grass because they have irrigation, and I’m kind of an outcast. The yard next door, they put desert in but most people have grass here... I know [one neighbor] really hates that I have this kind of landscaping. She’s never actually said anything to me, but she talked to my girlfriend once in passing” (mesic 178).

In response to the grievance, this resident raked and cleaned up her xeric yard to make it look neat. In spite of feeling pressure and disdain for having a xeric yard, the resident went on to say: “In this neighborhood people mind their own business,” essentially implying a ‘live and let live’ mentality. This mentality was strongest in the Wealthy Oasis neighborhood, where mixed landscapes are the norm. In the xeric area, however, most residents (three of the four households interviewed) felt obliged to match the look of their neighborhood (Table 2).

Overall, all interviewees emphasized the desire for well-trimmed, manicured yards, but many demonstrated acceptance for diverse landscape types. Some residents also feel pressure to maintain their landscapes for the betterment of the neighborhood or to ‘fit in’ locally. To some degree, place-based traditions establish and exert expectations to follow neighborhood standards or trends, as do social customs linked to Phoenix and other regions of the U.S.

### *Place Identities and Broader Regional Influences*

Landscaping practices also appear influenced by familial traditions and customs from other regions or former places of residence. Some residents who grew up in humid areas of the country expressed feeling detached from the “harsh” desert landscaping, while others simply do not like the look of the “brown desert.” Thus, they try to re-create what they were accustomed to as children or at prior places of residence, thereby potentially increasing water use since non-native plants typically require more irrigation in the desert compared to natives. Representative comments included:

“I grew up in Virginia and I had a very green yard. It took about three hours to mow. When I moved out to Phoenix, I wanted to keep that. I really like the look of grass” (mesic 179).

“My husband is from Florida and it was a real shock when we moved in here and realized that we actually have to do something to maintain the lawn, but it was a bit of home that we couldn’t part with so we’ve kept it” (oasis 391).

“[People] tend to try and do a Midwestern thing, which has some greenery in it to mow and then some shrubs and trees and stuff like that. Those people who are natives, probably less so. But I think the Midwest influence has made a yard [with a lawn and greenery] kind of more of the ideal” (xeric 253).



While people often think that newcomers are the ones bringing lawns to the Valley from other, more humid regions, it is critical to remember that a few other Phoenix-based studies—with broader, more representative samples—have consistently shown that newcomers do not prefer grassy landscapes overall (Larson et al. 2009; Martin et al. 2003; Yabiku et al. 2008). Instead, long-time residents tend to prefer the grassy landscapes to which they have become accustomed over time.

Interviewees who do intentionally cultivate plants from other places discussed their frustrations with maintaining non-native plants in the arid study region. Quotes included:

“My wife likes to maintain a rose garden, but it’s just not as easy here as it was where we were from. They literally grew like weeds there” (mesic 151).

“...[Maintaining a lawn] is so difficult and so expensive because you’re trying to do something that nature just says no, this isn’t really what we should be doing here” (oasis 391).

“I’ve always been partial to really big trees and a lawn since my dad gave me the responsibility of raking up leaves and mowing when I got older... [but] it just takes so much more effort here than it ever did when I was younger, and since I’ve moved into this house, I’ve just stuck with desert plants” (xeric 300).

Other residents commented that ‘keeping it local’ is a matter of minimizing maintenance requirements, as in: “If people keep [yards] regionalized...then that’s good. Otherwise, they’re going to have a long road ahead of them with a bunch of hard work getting things like [spruce trees from Seattle] to grow here” (xeric 262). On the other hand, some see the region as lacking a cohesive identity and therefore just stick with what they’ve learned. For instance:

“Phoenix really has no sense of itself. I feel like other regions of the country have some kind of unique kind of landscaping, but here everything is all over the place. I just stuck with what I know best, a lawn and some trees” (oasis 463).

In the end, people often just ‘do what they know,’ thereby reinforcing old habits and traditions. Yet environmental constraints sometimes impose barriers to long-standing preferences, and ultimately, maintenance considerations (including what people already know) win out. Several people we interviewed also hire landscapers to mow, prune, and clean-up yards. Particularly in the two wealthier neighborhoods with grass, three of the four residents interviewed hire a service to keep their yards well-maintained (Table 2). Meanwhile, only one informant in the xeric area hired a landscaping company, and that was to install the original landscape when they bought the home. Since the yard-care industry mostly seems to manicure yards in our relatively wealthy study neighborhoods, economic forces and the lawn-care industry appear to control decisions for some homeowners more so than others.

### **Place-Based Institutional Dynamics**

This section elaborates on the institutional dynamics unique to each neighborhood. As such, we must be especially careful not to overextend these results to other places.

### *Historic Mesic District*

The lush, green ‘lawns and palms’ aesthetic of the mesic study neighborhood appears largely maintained by social norms and a legacy of established customs that reinforce its historic character. Although the local neighborhood groups do not have the authority to create or enforce mandatory rules, rhetoric among neighborhood organizations encourages the maintenance of the original landscaping, which has been described as follows: Well-kept seas of grass and trees lie just beyond a curving line of 80-year-old Mexican Fan Palms and just beyond the lawns lie some of the most beautiful and spacious historic homes in Phoenix (Anonymous 2012).

As for formal rules, the neighborhood-based city ordinance that protects palm trees combines with informal historic traditions and social expectations to uphold the character of the area, which includes relatively lush, grassy landscapes. Yet internalized pressures to conform—along with some outwardly exerted expectations—seem just as strong, or stronger, than formal rules in determining yard choices. While local residents in this area also expressed concern about water conservation, most residents did not want to sacrifice green landscapes and the legacy of grassy yards that perpetuate water use. Therefore, a durable sense of place and history in this locale engrains the status quo and underpins the legacies of landscaping decision made in the past.

### *Wealthy Mountain Oasis*

In the highest income study neighborhood, appreciation for diverse landscape types—grass and otherwise—helps to shape its mixed, ‘oasis’ character. Spousal pressures and familial expectations were prevalent norms in this area, particularly in terms of residents’ desires for familiar plants they grew up with elsewhere (Table 2). Diversified preferences and contradictory desires (e.g., to have mesic vegetation while also wanting to conserve water) ultimately lead to compromises and a mix of neighborhood landscapes. Despite this diversity, all informants in the oasis neighborhood hold the same normative expectation for neatness. This rule is reinforced by HOA rules requiring “well-kept” yards (Anonymous 2012). HOA restrictions also *encourage* water-conserving landscapes, but they are not required. Meanwhile, although both rock and grass are permitted, all lawns must be kept green in the winter (Anonymous 2012). For aesthetic reasons, natural ‘bare’ desert is prohibited as well.

Since most residents in the Wealthy Oasis neighborhood reportedly hire landscapers to maintain yards (Table 2), the expectations and practices of the yard-care industry are important to consider. As one resident commented: “A lot of people in the neighborhood use a landscaper, including us. It’s more expensive than maintaining the yard ourselves, but it saves time. Both me and my wife work long hours and just don’t have time to do it” (oasis 463). Others emphasized not wanting to deal with their yard; they want a “nice” yard, but don’t want to take the time or effort to maintain it. Thus, multiple actors are involved with yard management, and examining lawn-care and other landscaping services are central to understanding the decisions and impacts of yard management, particularly in high-income areas.

*New Xeric Tracts*

Informants in the Xeric neighborhood did not report any influence of the HOA on their landscaping decisions, but rules are in place for certain choices and yard features. Specifically, HOA rules oblige “desert landscaping” for water conservation purposes in all front yards (Anonymous 2012). Yet individuals can still plant their own vegetation, as long as they irrigate and maintain it themselves. If planted vegetation dies or becomes diseased, the HOA can remove it at the homeowner’s costs. So while the HOA covenants strongly promote and even “require” xeric landscaping, residents ultimately can choose grass.

Similar to the other HOA neighborhood, formal rules in the xeric area dictate “well-trimmed” yards (Anonymous 2012). Although none of the residents referenced this restriction in interviews, all of them did express normative expectations for well-maintained yard, regardless of groundcover. Residents generally followed the xeric descriptive norm, however, and they also largely emphasized water conservation and fitting in with the desert and the local character of the area (Table 2).

**DISCUSSION AND IMPLICATIONS**

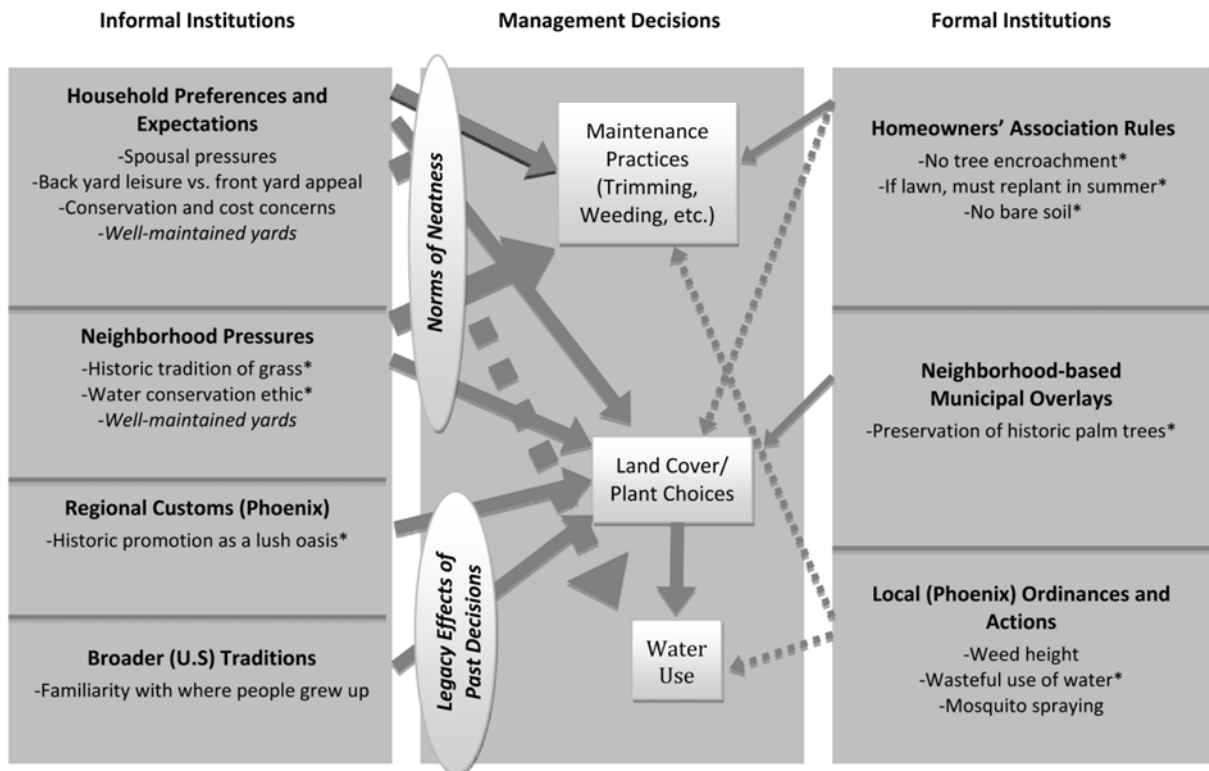
In sum, informal institutions were the strongest forces underlying land-management decisions in this study (Figure 3). Even where formal rules exist, they are often unknown, unenforced, and limited in influence, although they do sometimes codify norms. Across our Phoenix neighborhoods, landscapes exhibit variability in groundcover and plant choices, yet some similarities also exist. Specifically, the residents we interviewed expressed an overriding preference for well-manicured yards. In other words, norms did not dictate the common expectation for a traditional, monolithic lawn.

As for homogeneity in landscape preferences, the norm of neatness dominated across the three study neighborhoods, even though heterogeneity is seen in diverse plant and groundcover tastes within and across neighborhoods. Other studies have also found landscape homogeneity within neighborhoods in different regions, particularly where local norms are strong (Blaine et al. 2012; Nassauer et al. 2009). Alternatively, in areas lacking local customs, landscapes and their management may exhibit heterogeneous characteristics or adherence to the dominant tradition of a well-maintained lawn.

Although Homeowners’ Associations are generally thought to enforce homogeneity among households (Kennedy 1995), our non-HOA study area resulted in greater conformity of landscapes—specifically upholding the conventional lawn—compared to the two HOA-governed neighborhoods. One explanation for the lack of stated HOA influence is that local residents have already ‘bought into’ the established character of their neighborhood—and, by extension, the rules that govern it. Regardless, caution must be used in generalizing the findings from this study, since local customs emphasizing historic traditions in central Phoenix (i.e., lawns and palms) will not transfer to all places. The seemingly weak influence of HOA rules in our study must, therefore, be tested in other areas. All in all, however, our results resonate with other

research that emphasizes the importance of norms, cultural heritage, and socialized environments for constructing and managing landscapes (Robbins 2007; Larson et al. 2009; Nassuaer et al. 2009).

**Figure 3.** Diagrammatic Representation of Findings: Strengths of Associations between Social Institutions and Landscaping Practices.



*Notes:* The thickness of arrows indicates the relative strength of institutional drivers on varying landscaping practices. Dashed arrows represent rules that are not always known, actualized, or enforced. The circular items in italics represent dominate themes in relationships between drivers and practices. Finally, the asterisks denote rules that only apply in one or two of the study areas, but not all three of them. See Table 2 for more details.

Regarding norms, a couple of noteworthy insights emerge from this study and should be tested further. First, much of the pressure to maintain landscapes in certain ways is internalized within individuals, as opposed to being exerted by neighbors. This means descriptive norms may be sufficient in swaying people toward desirable practices. Moreover, getting residents to ‘enforce’ ordinances (e.g., regarding water discharges) may be tough if people are not willing to exert such pressures on others. Yet the use of positive, injunctive messages could be one mechanism for spurring change and adaptations to local environments and contemporary goals such as conserving water in desert regions. Regardless, attempts at landscape transitions (for whatever purpose) are remiss if they do not consider normative expectations and localized pressures.

Our findings indicate the potential for moving away from lawns toward alternatives to reduce water consumption or provide other benefits. However, it is important to recognize that no single landscape type may be ideal, since alternatives to lawns may lead to negative outcomes and tradeoffs—both environmentally and socially (Larson et al. 2009). For instance, water-conserving landscapes may increase herbicide use (to spray weeds in rock) or exacerbate urban heat (Larson et al. 2010). Further, barriers exist to altering landscapes toward urban sustainability, especially naturalistic landscapes that are seen as messy and disorderly (Nassauer 1995; Nassauer et al. 2009). Still other constraints to altering landscapes include costs and socially negotiated preferences. The legacy effects of past decisions and experiences also constrain and influence modern landscaping decisions, including landscapes installed by other entities (e.g., developers and landscaping companies) as well as management choices established in the past or in other places.

This finding is consistent with other research that has found that preexisting yard choices structure inputs and sometimes dictate or constrain management (Robbins 2007; Larson et al. 2010). Such legacy effects are particularly strong where norms emphasize historic customs or traditions. Another legacy stems from habituated preferences and practices from social experiences and family traditions, sometimes in places very different (e.g., climatologically) than peoples' current homes. This can lead indirectly to heightened water use (e.g., by irrigating vegetation from relatively humid regions), in addition to difficulties in maintaining non-native landscapes. By comparison, native or local landscaping can be advantageous due to their low-maintenance and, therefore, leisure benefits.

Multiple studies with broader samples (cited earlier) have shown that long-time Phoenicians prefer the historically verdant regional landscape (e.g., green, irrigated lawns). But in newer neighborhoods and our predominately xeric study area, other residents tend to embrace the desert environment and water conservation as the local ideal. Still others, particularly in the oasis study neighborhood, do not have a strong sense of regional identity, which may explain the diversified mix of landscapes locally. The promotion of regional or place-based identities could therefore help to foster particular types of landscapes; in Phoenix, for example, moving away from the traditional campaigns that stress 'doing away with the desert' (Larson et al. 2009) may help establish more water-conserving, naturalistic yards. Nonetheless, additional research is needed to more fully explore landscaping trends in relation to regional identities across a diversity of cities and biomes.

Complexities and contradictions regarding water use and conservation are also worth further consideration. Although most Phoenix residents express concerns about conservation, this and other studies show that such concerns often do not lead to low-water-use landscaping choices (Larsen and Harlan 2006; Larson et al. 2010). Instead, personal preferences (e.g., for specific plants) and social norms (e.g., for neatness) tend to trump conservation concerns. Our xeric neighborhood appears to be an exception in that desert-like landscapes are valued locally for both fitting into the environment and the neighborhood. Even so, our findings parallel an Australian study that found that interests in private leisure outweigh conservation concerns in gardening decision, even though residents evoke stewardship and national pride in expressing awareness and concerns about the nation's aridity and drought conditions (Askew and McGuirk 2004).

In sum, appealing to residents' concerns, local identities, and maintenance considerations offer ways to encourage water-conserving landscapes. Although some experts suggest that watering restrictions are far more effective than voluntary incentives or approaches to conservation (Vickers 2006), formal rules require monitoring and enforcement can be difficult across a large number of decision makers (Ostrom 1990). Thus, various strategies used in combination with informal rules appear most effective for reducing outdoor water demands or achieving other goals. Examples include establishing ordinances and neighborly 'cops' to 'enforce' them, while also appealing to established customs and concerns as well as the social tendency to comply with local norms. Economic incentives could also be helpful, such as increasing the cost of water or providing rebates to convert landscapes (e.g., remove grass), as done in other municipalities throughout the greater Phoenix region (but not the City of Phoenix itself) and elsewhere in the U.S.

## CONCLUSION

Instilling and reinforcing norms seem to be a more powerful way to encourage desirable land-management practices, since this study found that normative beliefs and pressures were more strongly invoked than formal rules as influences on residents' decisions. If homeowners or towns wish to establish restrictions for particular landscaping benefits, they need to inform residents and work to enforce such rules. Combining informal strategies with formal rules may be most effective overall, for instance, through messaging in newsletters or other forums that establish certain yard choices or practices as not only required but also as socially desirable and expected.

Normative emphasis on neatness deviates from the "messiness" of non-managed ecosystems, thereby posing a barrier to promoting naturalistic landscapes with ecological benefits. Given strong social expectations for well-maintained yards, "cues of care" seem critical for fostering the cultural sustainability of landscapes regardless of whether they are lawns or some alternative (Nassauer et al. 2009). Such an approach might foster the desirability of xeric yards where water conservation is critical, though in the face of tradeoffs, the promotion of diverse landscapes may be worthwhile for both environmental and social reasons.

Building upon this research, the biggest priority for future studies is testing our Phoenix-based findings in other neighborhoods and regions, and with broader, more generalizable samples. Given common assumptions about residential landscapes and social institutions, important questions to examine include: Do homeowner associations really result in landscape conformity and therefore urban homogeneity, and if so, how? In which cases do landscape choices follow past decisions and social customs? And, how can landscapes be designed in diverse biomes to maximize both their private and public benefits? In the face of water scarcity, as well as other challenges, the answers to these questions will advance human-environment research, landscape designs, and urban planning for sustainability.

**LITERATURE CITED**

- Adger, W.N., Brown K., Fairbrass, J., Jordan A., Paavoli, J., Rosendo, S., Seyfang, G. 2003. Governance for sustainability: toward a thick analysis of environmental decision-making. *Environment and Planning* 35: 1095-1110.
- Anonymous. 2012. Neighborhood-specific citations (e.g., for HOAs) have been omitted to avoid identifying the specific areas in our study.
- Askew, L.E., McGuirk, P.M. 2004. Watering the suburbs: distinction, conformity and the suburban garden. *Australian Geographer* 35(1): 17–37.
- Blaine, T.W., Clayton, S., Robbins, P., Grewal, P.S. 2012. Homeowner attitudes and practices towards residential landscape management in Ohio, USA. *Environmental Management* 50: 257-271.
- Bormann, F.H., Balmori, D., Geballe, G.T. 2001. *Redesigning the American Lawn: A Search for Environmental Harmony*, 2nd ed. Yale University Press, New Haven.
- City of Phoenix. 2009. *Visibility Requirements for Landscaping Corner Lots (Sec. 31-13 Phoenix Ordinances)*. Phoenix, AZ.
- City of Phoenix. 2011. Neighborhood Services Department, personal communication with anonymous employee, November 15, 2011.
- Cook, E., Hall, S., Larson, K.L. 2012. Residential landscapes in an urban socio-ecological context: Multi-scalar drivers and legacies of management practices, ecological structure, and ecosystem services. *Urban Ecosystems* 15(1): 19-52. DOI 10.1007/s11252-011-0197-0.
- Hirsch, R., Baxter, J. 2009. The look of the lawn: Pesticide policy preference and health-risk perception in context. *Environment and Planning C* 27(3): 468-490.
- Kennedy, D.J. 1995. Residential associations as state actors: Regulating the impact of gated communities on non-members. *The Yale Law Journal* 105: 761-793.
- Larsen, L., Harlan, S. 2006. Desert dreamscapes: residential landscape preference and behavior. *Landscape and Urban Planning* 78(1-2): 85-100.
- Larson, K.L., Cook, E., Hall, S., Funke, B., Strawhacker, C., Turner, V.K. 2008. *Social-Ecological Dynamics of Residential Landscapes: Human Drivers of Management Practices and Ecological Structure in an Urban Ecosystem Context*. Final Report from an Interdisciplinary Graduate Workshop. Global Institute of Sustainability, Arizona State University, Tempe.
- Larson, K.L., Casagrande, D., Harlan, S., Yabiku, S. 2009. Residents' yard choices and rationales in a desert city: social priorities, ecological impacts, and decision tradeoffs. *Environmental Management* 44: 921-937.
- Larson, K.L., Cook, E., Strawhacker, C., Hall, S. 2010. The influence of diverse values, ecological structure, and geographic context on residents' multifaceted landscaping decisions. *Human Ecology* 38(6): 747-761.
- Lehman, J.T., Bell, D.W., McDonald, K.E. 2009. Reduced river phosphorus following implementation of a lawn fertilizer ordinance. *Lake and Reservoir Management* 25(3): 307-312.
- Martin, C.A., Peterson, K.A., Stabler, L.B. 2003. Residential landscaping in Phoenix, Arizona, U.S.: Practices and preferences relative to covenants, codes and restrictions. *Journal of Arboriculture* 29(1): 9-17.

- Milesi, C., Running, S.W., Elvidge, C.D., Dietz, J.B., Tuttle, B.T., Nemani, R.R. 2005. Mapping and modeling the biogeochemical cycling of turf grasses in the United States. *Environmental Management* 36(3): 426-438.
- Nassauer, J.I. 1988. The aesthetics of horticulture: Neatness as a form of care. *HortScience* 23(6): 973-977.
- Nassauer, J.I. 1995. Messy ecosystems, orderly frames. *Landscape Journal* 14(2): 161-170.
- Nassauer, J.I. 2012. Landscape as medium and method for syntheses in urban ecological design. *Landscape and Urban Planning* 106: 221-229.
- Nassauer, J., Wang, Z., Dayrell, E. 2009. What will the neighbors think? Cultural norms and ecological design. *Landscape and Urban Planning* 92: 282-292.
- Ostrom, H. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. University of Cambridge Press, New York.
- Ostrom, H. 2011. Background on the institutional analysis and development framework. *The Policy Studies Journal* 39(1): 7-27.
- Robbins, P. 2007. *Lawn people: How Grasses, Weeds, and Chemicals Make Us Who We Are*. Temple University Press, Philadelphia, PA.
- Roy Chowdhury, R., Larson K.L., Grove J.M., Polsky C., Ogden L., Onsted J., Cook, E. 2011. A multi-scalar approach to theorizing socio-ecological dynamics of urban residential landscapes. *Cities and the Environment* 4(1): 6.
- Saarinen, T.F. 1976. *Environmental Planning: Perception and Behavior*. Houghton Mifflin Company, Boston.
- Schultz, P.W., Nolan, J.M., Cialdini, R.B., Goldstein, N.J., Griskevicius, V. 2007. The constructive, destructive, and reconstructive power of social norms. *Psychological Science* 18(5): 429-434.
- Stern, P.C. 2000. Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues* 56(3): 407-424.
- Tuan, Y. 1974. *Topophilia: A Study of Environmental Perception, Attitudes, and Values*. Columbia University Press, New York.
- Turner, V.K., Ibes, D. 2011. The impact of homeowners associations on residential water demand management in Phoenix, Arizona. *Urban Geography* 32(8): 1167-1188.
- Vickers, A. 2006. New directions in lawn and landscape water conservation. *Journal of the American Water Works Association* 98(2): 56.
- Yabiku, S.T., Casagrande, D.G., Farley-Metzger, E. 2008. Preferences for landscape choice in a Southwestern desert city. *Environment and Behavior* 40(3): 382-400.