Water Action Team

UCLA Education for Sustainable
Living Program
Action Research Team Program

Winter 2012-Spring 2013

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Abstract

In this paper, we will give an overview of our project's goals and objectives, explain why these objectives are important to the UCLA community, and discuss the initial conditions our team met with. Next we will describe our research methodology, give a data and cost analysis, and list our key findings. Lastly we will give recommendations for UCLA action based off of our data analysis and conclude the paper. Project references and an appendix of project materials and data sets may be found at the end of the report.

Executive Summary

Over the fall and winter quarters of the 2012-2013 academic year, our Action Research Team made substantial progress in helping the UCLA Water Task Force and UCLA Housing & Hospitality identify areas in which cost effective and substantial water savings may be realized. We conducted primary research in each of our two focus areas: Campus plumbing fixture changeovers and residential landscaping changeovers. The results of our data and analyses are being used by the UCLA Water Task Force to help develop the UCLA Water Action Plan. They were also displayed at the City of Los Angeles' Metropolitan Water District Spring Green Exposition.

Overview, Objectives & Project Goals

The overarching goal of the ESLP Water Action Team is to help UCLA meet the ambitious goals set out by the University of California Water Policy by researching proven water saving methods and policies and by helping to implement cost effective solutions. The UC Water

Policy mandates that each UC campus reduce it's water use by 20% by 2020.

We focused our efforts on improving two categories: Restroom fixtures and landscaping on the Hill (on-campus residential area). These two areas were chosen because they would both generate dramatic water savings and are also feasible given campus practices and management. However, we also wanted to ensure that these changeovers would be feasible given student preferences as well. Accordingly, we created and conducted a survey in order to better understand students on the Hill's functional concerns and aesthetic preferences related to drought-tolerant landscaping and artificial turf. Lastly, our team sought to reduce water use in the resident halls and to generate greater awareness of water issues by designing a removable mirror cling decal reminding students to save water and providing them with resources to report leaks.

Significance & Background

With Californian deltas reclining and the Colorado River water agreement providing an unreliable water source, California's water future is in need of more security and certainty. Additionally, California is mostly placed in the arid west where water demand is high and natural state water sources are limited; additionally, the human population will continue to increase as will the water demand. Although the state is adjacent to coastal beaches all along its western edge, the ocean only contains salt water which provides an infeasible supply of potable water; the desalination process is currently too expensive. Therefore, in an effort to reduce potable water consumption, the Water Policy of 2013 was passed.

The UC Water Policy mandates that each UC campus reduce it's water use by 20% by 2020. UCLA has already reduced its water consumption by 11% from our 1999-2002 baseline.

Accordingly, the University has an additional 9 percent reduction goal by 2020. UCLA's Water Task Force, which is comprised of UCLA management, staff and faculty, must prepare a draft UCLA Water Plan by July 2013 and a final UCLA Water Plan by December of 2013. Accordingly our Water Action Team sought to work with the Water Task Force to conduct primary research, do cost-benefit analyses for various changeover scenarios, and make recommendations based off of those findings.

Initial Conditions

Given the project's relationship to the passing of the UC Water Action Policy, this is the first year that there is a student team designated to take on-campus water related initiatives through the Action Research Team program (ART). Since we lacked student predecessors and previously collected data, our group worked closely with the Water Task Force to develop our course of action.

Before we could begin any of our projects, we did some research of our own; we researched cost effective water conservation efforts previously done by other universities and hotels, and also examined new innovations in water-saving (e.g. UC Verde buffalo grass).

Through the suggestion of the director of the UCLA Plumbing Department, Tim Petta, we began collecting data on faucet and toilet use in the men and women's bathrooms of the fifth floor of Math Sciences and of the basement of Powell Library. These restrooms were selected because they currently lack low-flow, efficient water appliances.

After we compiled our toilet and faucet baseline data, we expanded our project to include drought tolerant landscaping and artificial turf at the recommendation of Aliana Lungo-Shapiro, the Sustainability Manager of UCLA's Housing and Hospitality Services. Working with Aliana

as well as Art Tieck, the Landscaping Manager of UCLA's residential areas, we originally focused on drip irrigation, since that was an initiative the Hill had already begun undertaking. However, our lack of technical knowledge regarding irrigation systems made our forays into designing irrigation plans unproductive, though it was informative and interesting for our team.

Our efforts on the Hill shifted more toward identifying potential areas on the Hill that could be changed to drought tolerant landscaping or artificial turf. We analyzed four locations in Canyon Point that we selected based off of their potential savings and bureaucratic feasibility.

Through these discussions about residential landscaping, it became apparent that one potential challenge inhibiting the implementation water saving landscaping on the Hill was the assumption that students prefer landscape rich in color (e.g. green) and textures (e.g. flowers), and that drought-tolerant plants lack these characteristics throughout all or part of the year. Therefore, we created the need to conduct a survey of student landscaping preferences and concerns.

Lastly, due to a perceived lack of student awareness of how to report leaks on the Hill, we designed a mirror cling that would remind students to save water while also providing them with the number to call to report leaks.

Research Methodology

After realizing the potential water savings on campus, we began to consult with staff from UCLA, gather field data, and conduct surveys. Collection of field data for faucets was completed by all of the members on the team. The surveys for drought tolerant landscaping and artificial turf were created by team members and distributed via email to students in On-Campus Housing, as well as at events including E3's Earth Day Fair and Ecochella.

The first step for the faucet data collection was for all team members to spend multiple 15 minute periods of time counting the number of seconds that people used the sinks in bathrooms of Boelter Hall and Powell Library. We collected data for 50 male users and 50 female users in both the Boelter and Powell bathrooms for a total of 200 users. Knowing how long people used the sinks was key to estimating an appropriate metered sink time so that each push of the faucet allowed the sink to run for a time of adequate use.

The next step was to estimate the costs and savings of switching to metered sinks so that their installation could be justified from an economical standpoint. We collected more bathroom data by waiting during the busiest times when people most use the bathrooms and counted the number of sink users during the specified time. The chosen time was X:50 – X:05 when classes are getting out and people are using the bathrooms before class. We then assumed that there are 8 busy periods in the bathroom per day and 5 busy days per week. In analyzing our data we took these considerations when running the numbers to provide water and money saving estimates.

In researching perceptions of drought tolerant landscaping and artificial turf, a survey was created and completed on computers by students. To attract more survey participants, those students surveyed were entered into a raffle for Jazz-Reggae Tickets. In total we were able to get more than 130 surveys completed. The surveys were read and analyzed to get an overall understanding of student thoughts about drought tolerant landscaping and artificial turf, and any points in the survey that could be represented graphically were displayed appropriately.

The UCLA staff consultation portion of the project assisted most of what we did for our metered faucet and drought tolerant landscaping and artificial turf investigations. Water Task Force meetings were mostly informative for our work on the metered faucets. Meetings on the Hill were most useful for our work with drought tolerant landscaping and artificial turf.

Data & Cost Analysis

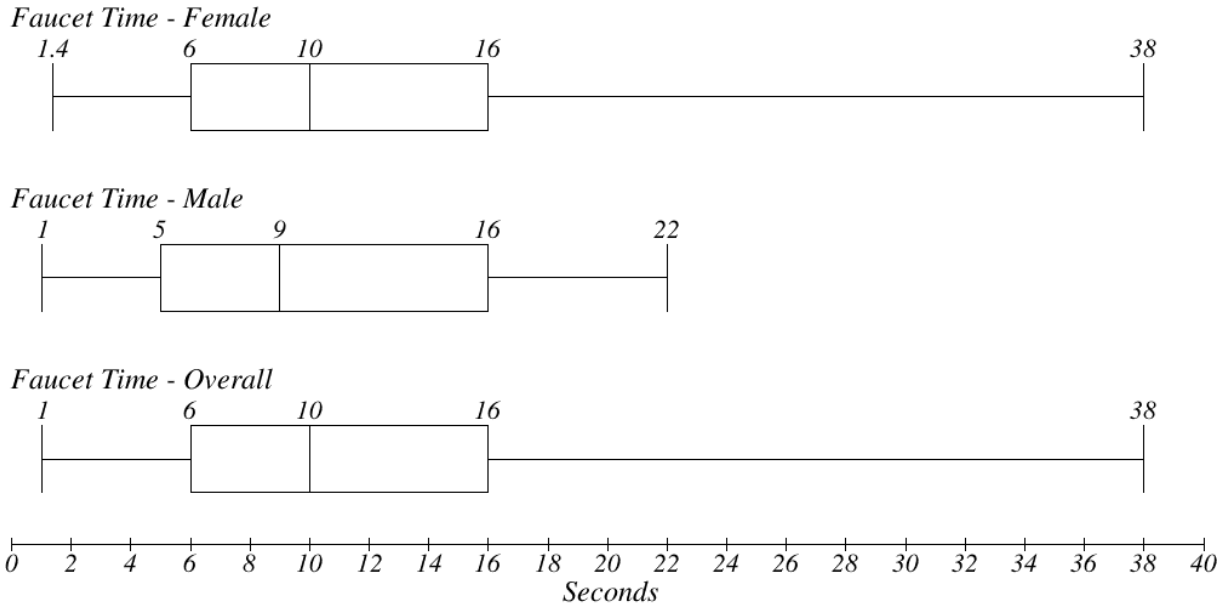


Figure 1. This box and whisker plot shows the amounts of times men, women, and combined men and women used sinks for. This data comes from a sample of 50 men and 50 women in Powell and 50 men and 50 women in Boelter Hall. The average for women is 10 second use, men is 9 second use, and the combined average is 10 seconds per user. The females have more extraneous users where one woman turned on the water and then fixed her hair without using any of the running water. The averages helped us come up with possible metered run times for the sinks when the lever is pushed down.

Water Savings in Dollars and Gallons and Payback Period for 5 and 8 Second Metered Sinks

Metered Sink Time per Push	5 Year Operation Savings (dollars)	5 Year Operation Savings (gallons water)	10 Year Operation Savings (dollars)	10 Year Operation Savings (gallons water)	Payback Period (years)
5 Second Metered Sink	6646.1	853637.16	16292.2	1707274.3	**1.5550326**
8 Second Metered Sink	3972.5	617035.39	10945	1234070.7	**2.1513087**

Figure 2. This table shows the various savings in dollars and gallons of water with initial costs considered. Initial costs are $150 per sink with 20 sinks adding to a total initial cost of $3000. The numbers are included for both 5 year duration and 10 year duration of use. The payback period is also included which is the time at which the calculated savings are equal to the initial cost to install the metered sinks ($3000). Savings are increased with lesser meter times however the user must press the lever more often.

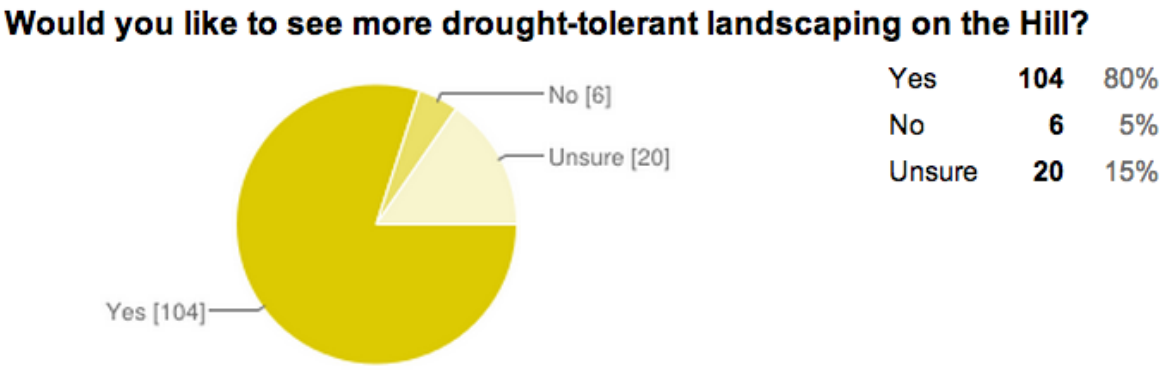


Figure 3. This pie graph represents the number of students surveyed that answered to the question of whether they wanted to see more drought-tolerant landscaping on the Hill. The general consensus was yes, with 80% of people saying yes, only 5% saying no, and 15% being unsure about whether they wanted more drought tolerant landscaping.

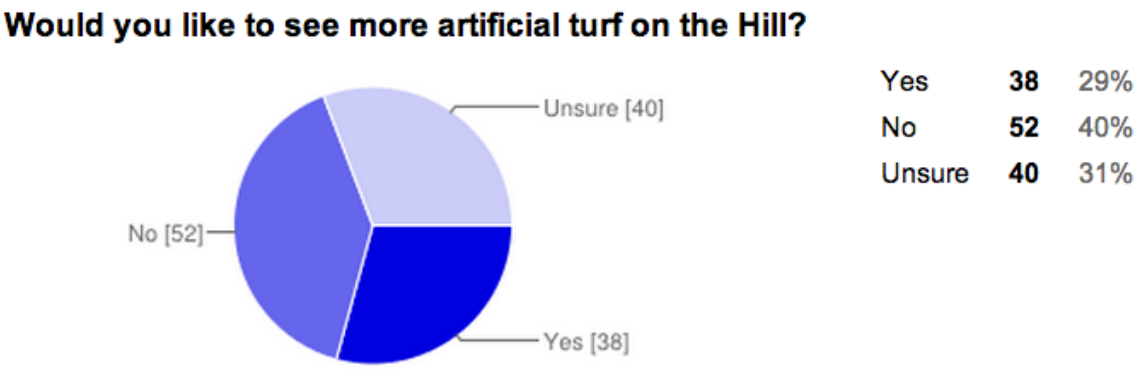


Figure 4. This pie graph represents the number of students surveyed that answered to the question of whether they wanted to see more artificial turf on the Hill. Most students were opposed to having artificial turf on campus: 40% said no, 29% said no, and 31% were unsure. These results were much less definite than the results for drought tolerant landscape perceptions.

(Sprinklers for 5 min, 3 days per week)	Total Gallons/Week	Total Gallons/Year
Patch 1	63.6	3307.2
Patch 2	118.95	6185.4
Patch 3	223.35	11614.2
Total	405.9	21106.8
Cost (dollars)	**4.17**	**217**

Figure 5. This table shows the costs of water for a few patches of conventional grass. These costs are the potential savings if the patches were converted to artificial turf because artificial turf requires no watering.

Key Findings

In the course of our research, faucets proved to have great potential for saving water and money for UCLA. The mechanically metered faucets, which are less expensive and have fewer

maintenance costs than censored faucets, are only $150 per sink for parts and labor. Since we examined 20 bathroom faucets, the initial cost for converting these manual faucets into mechanically metered faucets is only $3000. That may sound like a lot but the estimated cost savings shows that these sinks will pay for themselves in 1.56 years if they are metered at 5 seconds per push, and 2.2 years if they are metered at 8 seconds per push. Assuming that the sinks are reliable and do not require frequent maintenance, this decision is financially sound.

From an environmental perspective, the sinks will also be a huge aid to reducing UCLA's water use. The 20 sinks combined, if converted to metered operation, will save approximately 1.25 million gallons of water over a 10 year period. This comes out to a cost savings of about $15,000 which could be used to improve other parts of UCLA. These are only a few out of the hundreds of sinks that are used by faculty and staff that could be changed over to mechanical metered sinks and then the savings would be astronomical.

The surveys we conducted that looked at student perceptions of drought tolerant landscaping and artificial turf had mixed results. Some students wanted both drought tolerant landscapes and artificial turf, while others wanted either one or the other, or some students didn't want either. General consensus showed that people overall liked the idea of having more sustainable drought tolerant landscaping instead of luscious flower beds. Students mostly understood that UCLA is in a dry climate and like the thought of native plants existing in some of the planters on the hill. There was some minor objection for aesthetic reasons because certain flowers may be more visually appealing than drought-tolerant plants like cacti, but most students were open to the idea of converting some planters to drought-resistant plants.

When it came to artificial turf, on the other hand, most students exhibited a preference for conventional grass. This is unfortunately considering that switching one square foot of grass at

UCLA to artificial turf saves roughly 70 gallons of water per year. Overall, students don't like the idea of a synthetic turf because they think it doesn't naturally replenish and clean itself. This came with their thinking that without regular cleaning, synthetic turf would become excessively dirty and not attractive to sit or lay down on. Some students who were talked to about the water savings of changing to artificial turf seemed impressed, but many still expressed their liking for conventional grass. Another reason for some student dislike for artificial turf is that it heats up much faster than conventional grass, so if a location like the Intramural Field were changed to artificial turf the water savings would be great, but it would be at the expense of the user of that grass who would become much hotter, quicker. This could be bad for athletic activities that are commonly done on grassy areas such as the IM field.

Recommendations

Based off of our findings, our Action Research Team recommends that future teams continue to focus water conservation efforts on landscaping and fixture replacement because both aspects have great potential for significant water saving. Hopefully our research will serve as a guide for next year's Water Action Team.

We recommend that they have GIS experience if possible, since sustainable landscape planning has ample opportunity for spatial analysis using GIS. Based on the survey results we find that there is a need for education about the advantages of drought tolerant landscaping to students. Perhaps making signage near drought tolerant plants or an outreach event next year could be beneficial. More research on the upfront cost of installing artificial turf would be helpful in creating a cost analysis. We recommend meeting with the hill landscape manager and sustainability manager early in the process to determine more potentially good areas for artificial

turf or drought tolerant landscaping on the hill.

To continue changing old faucets to metered faucets, we recommend expanding efforts to other buildings and bathrooms on campus and calculating the savings by using our research and baseline data as a model. Calculating the amount of savings per sink and counting the number of sinks in a building would give a good estimate of the potential water savings from replacing fixtures on a larger scale. We found that the flow rate of sinks on campus varies quite a bit. To maximize water savings, we recommend examining faucets in buildings on campus to determine which have the highest flow rate and therefore where fixtures replacement should be prioritized.

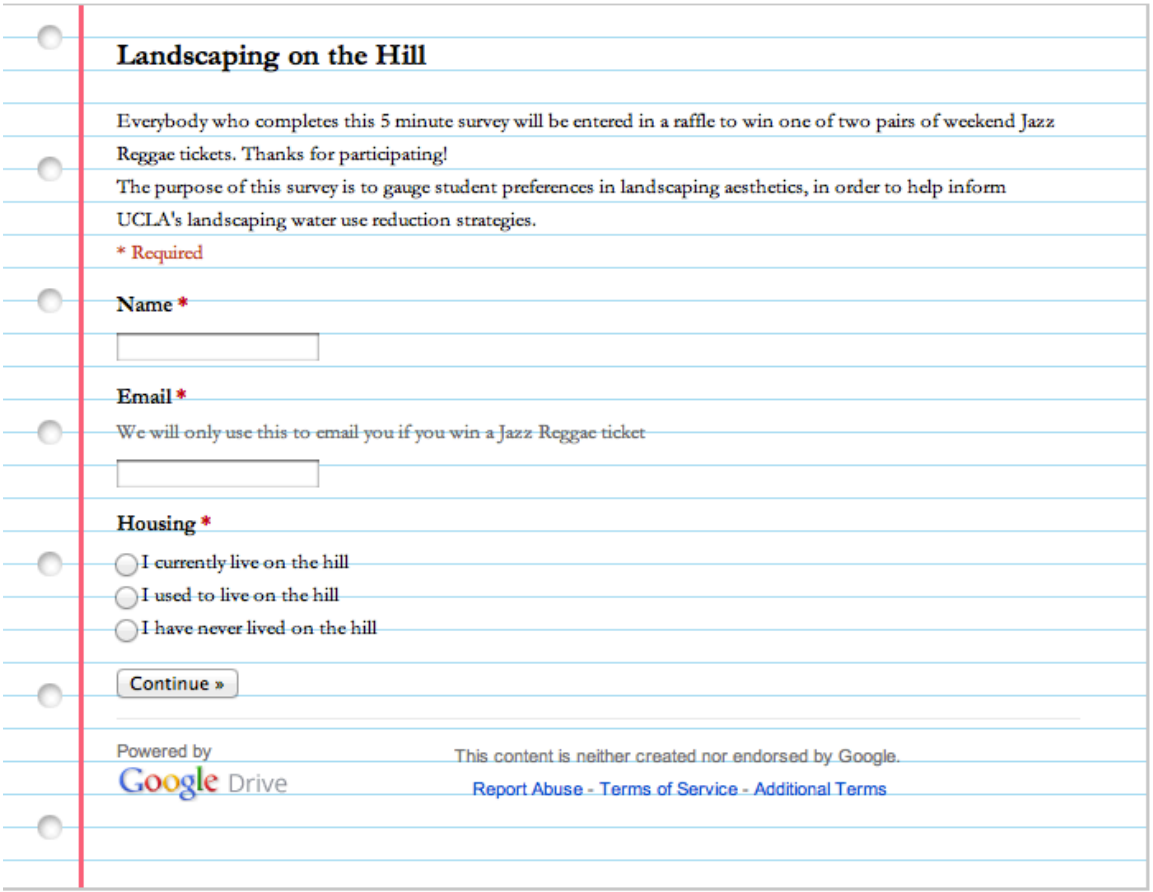
Conclusion

In conclusion, our Water Action Team was able to successfully help the UCLA Water Task Force and UCLA Housing & Hospitality identify areas in which they may achieve cost effective and substantial water savings. The results of our data and analyses regarding campus plumbing fixtures and residential landscaping are being used by the UCLA Water Task Force to help develop the UCLA Water Action Plan. Currently, UCLA has reduced its water usage by 11% from the 1999-2002 baseline, meaning that we have a 9% reduction goal by 2020. Our research shows that restroom fixture replacement and more sustainable landscaping offer great opportunity to aid in this water reduction goal. The survey about sustainable landscaping that hill residents took gave us a better understanding of student preferences and knowledge about drought tolerant landscaping and artificial turf. This information and data can be used to focus future projects and will be helpful to be able to provide UCLA Housing & Hospitality with concrete data showing how students feel about the landscaping options. Hopefully these student surveys will complement the water and cost savings analysis of landscaping changes and help to

create more drought tolerant and artificial turf areas on the hill. Our fixture replacement research presents evidence for the cost and water efficiency of metered faucets and dual flush toilets. Our baseline data collection and calculations for replacement can be used as an example that can be amplified to a larger scale to demonstrate the amount of water that can be saved. Overall, our finding show that dramatic reductions in water usage at UCLA are feasible and cost effective.

Appendix

Landscaping Survey



Landscaping on the Hill

Everybody who completes this 5 minute survey will be entered in a raffle to win one of two pairs of weekend Jazz Reggae tickets. Thanks for participating!

The purpose of this survey is to gauge student preferences in landscaping aesthetics, in order to help inform UCLA's landscaping water use reduction strategies.

* Required

Name *

Email *

We will only use this to email you if you win a Jazz Reggae ticket

Housing *

- I currently live on the hill
- I used to live on the hill
- I have never lived on the hill

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Landscaping on the Hill

* Required

Drought tolerant landscaping

Image A:
http://goo.gl/4Yc4z
Image B:
http://goo.gl/CTYED

Do you have a preference between these two types of landscaping? *

- Prefer image A
- Prefer image B
- I like both
- No preference

Do you know what drought-tolerant landscaping is? *

- Yes
- No
- Sort of

Images of drought tolerant landscaping:
http://goo.gl/mBjXd
http://goo.gl/LTqg4
http://goo.gl/dWqc5
http://goo.gl/m2pEV

Drought-tolerant landscaping utilizes plants that are adapted to dry conditions and require less frequent watering. Pros: These plants are better adapted to the California climate and can help minimize the amount of water used in irrigation. Cons: These plants often go dormant during the summer months.

Would you like to see more drought-tolerant landscaping on the Hill? *

- ◯ Yes
- ◯ No
- ◯ Unsure

If you have concerns about drought-tolerant landscaping, what are they?

« Back Continue »

Landscaping on the Hill

* Required

Artificial Turf

Image A:
http://goo.gl/alIOt
Image B:
http://goo.gl/euV5N

Do you have a preference between these two lawn types? *

- ◯ Prefer image A
- ◯ Prefer image B
- ◯ I like both
- ◯ No preference

Do you know what artificial turf is? *

- ◯ Yes
- ◯ No
- ◯ Sort of

Pictures of artificial turf.
http://goo.gl/OnYMI
http://goo.gl/3ypkB
http://goo.gl/as7WJ

Drought-tolerant landscaping utilizes plants that are adapted to dry conditions and require less frequent watering. Pros: These plants are better adapted to the California climate and can help minimize the amount of water used in irrigation. Cons: These plants often go dormant during the summer months.

Would you like to see more drought-tolerant landscaping on the Hill? *

- ◯ Yes
- ◯ No
- ◯ Unsure

If you have concerns about drought-tolerant landscaping, what are they?

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Artificial turf is a surface of synthetic fibers that is made to look like real grass. Pros: Artificial turf stands up well to heavy use and does not need irrigation or trimming (which also means no allergies or wet grass), as opposed to traditional grass, which requires frequent watering, maintenance, and replacement and often forms dry/dead patches in dry weather. Cons: Heat retention and the fact that artificial turf systems lack the ability to self-sanitize the way natural turf systems do.

Would you like to see more artificial turf on the Hill? *

- ◯ Yes
- ◯ No
- ◯ Unsure

If you have concerns about artificial turf, what are they?

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Images used in Survey

Conventional Landscaping

Drought Tolerant


488 Hilgard Avenue
Exit Street View
Hilgard Av
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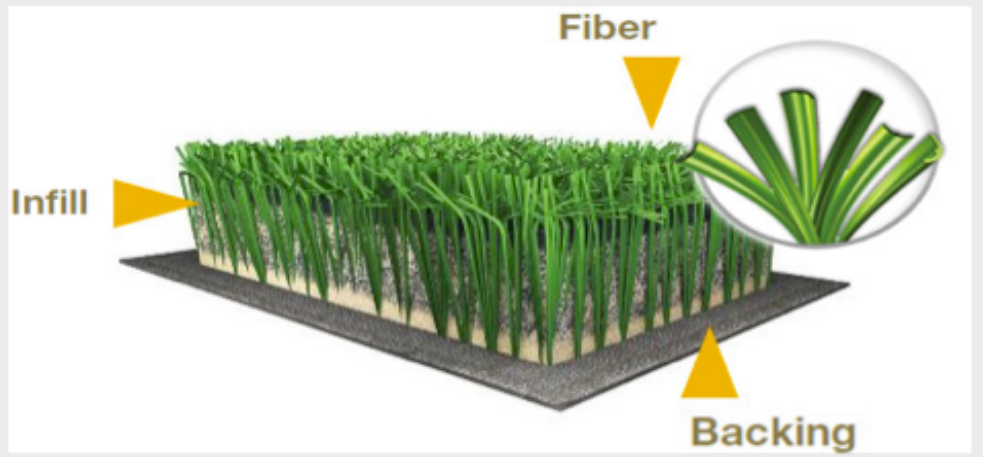
Artificial Turf



Conventional Grass

Mirror Cling