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LANDSCAPE SIZE BASED ON TAX ASSESSOR RECORDED LOT SIZE

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Executive Summary

Residential outdoor water waste is a major problem in the state of Utah. State and city governments are continually seeking ways to cut waste and conserve water. The primary goal is to get homeowners to water their turf according to its basic needs. In Utah, this basic water need for turf is 22.9 inches of water per watering season (about 15 gallons per square foot). One of the problems that face water conservation programs is that water is distributed and measured in gallons per household and not gallons per square foot of landscape. In order to convert total gallons to gallons used per landscaped foot, there needs to be a way to calculate average landscape size based on a total lot size measurement.

The *Slow the Flow* Program

In order to help residents and large property owners conserve water, two of Utah's water conservation districts gave funding to Utah State University to organize the *Slow the Flow, Save H2O* program[2]. The *Slow the Flow, Save H2O* program began conducting modified water audits, called water checks, in 1996. These water checks have reached over 6,000 homeowners and 200 large water users (parks, businesses, golf courses, etc.). Water checks are free to those who request them through a toll free telephone number. A water check consists of a visual inspection of ones irrigation system, a test to measure precipitation rate and distribution uniformity, a soil test, and a measurement of the property. With this information the water checkers can construct a watering schedule that is specific to the homeowner's needs.

The program tracks the water use of the resident over the next several years to see if the water check is helping to change watering habits. Because of the measurements taken at each lot, water use can be calculated at the turf water requirement.

[1] Utah State is an affirmative action/equal opportunity institution
[2] Earl K. Jackson, Paula Mohajer; 2003 National Irrigation Show proceedings

Measurement Methods

Measurements are made using a measuring tape and a measuring wheel. Because of the irregular shape of most landscapes, the total lot size if first measured and then the hardscape is measured. Hardscape is anything that is not watered, such as the house, driveway, patio, and sidewalk. Total lot size includes all easements. The hardscape size is then subtracted from total lot size to get total irrigated landscape size.

On properties larger than one acre, for example, parks and golf courses, water checkers use GPS units to get measurements. All measurements for large lots, as well as residential lots, are recorded in square feet measurements.

Correlation between Total Landscape Size and Tax Assessor's Recorded Lot Size

With the information on landscape sizes collected from the water checks, we hope to derive an equation that will allow anyone to approximate total landscape size on any given lot.

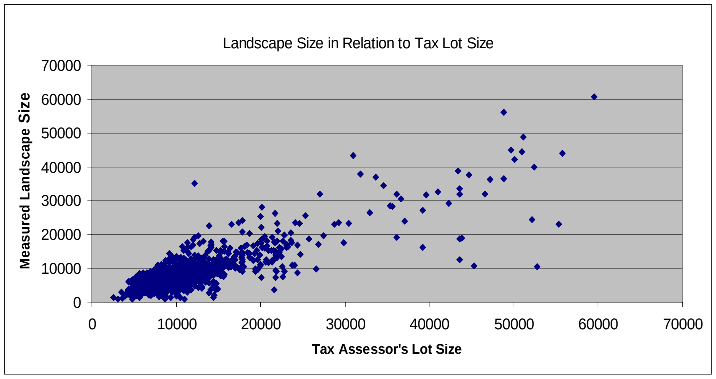
County recorder offices have records on each residential lot in their county. This record contains some information on lot sizes. This lot size information is used by the county tax authority to assess property taxes on residential lots. The lot size information is recorded in acres and does not include easements and common areas. This record is public knowledge and can be accessed from the recorder's office. Some counties are even starting to offer this record online. The goal of our research will be to estimate landscape size based on this public tax assessor's lot size information.

The *Slow the Flow* program has completed 6,242 water audits across Utah. They have been done in seven counties, with the majority being in Salt Lake and Utah counties. Of these 6,242 participants, assessor's tax lot size information was collected on 1,746. These were the records that had the most complete address information and lot measurements.

After we collected the tax assessor's lot size information we started to compare it to our measured lot sizes. The theory was that the assessor's lot size would be on average 8-15% smaller than our total measured landscape size. The reasoning being that the easements would make our total measurements larger. We observed that the average tax lot size was 13% smaller than our measured lot size.

Once we collected our data, we took a look at the relationship between tax lot size and landscape size. **Graph 1** shows the relationship between tax lot size (the X axis) and measured landscape size (the Y axis).

Graph 1



In order to explain the data we ran a regression equation using the data collected. A regression equation[3] is a mathematical formula that will let us insert any given tax lot size and get the corresponding landscape size. Each regression equation has an R-squared value that tells what percent of the variation is defined by the regression equation[4]. The closer the R-squared value is to 100%, the better the "fit" the data is to the regression equation. The data was analyzed using both linear and non-linear regression. Both yielded nearly the same results; however, the linear equation yielded a slightly higher R-squared value and is easier to implement.

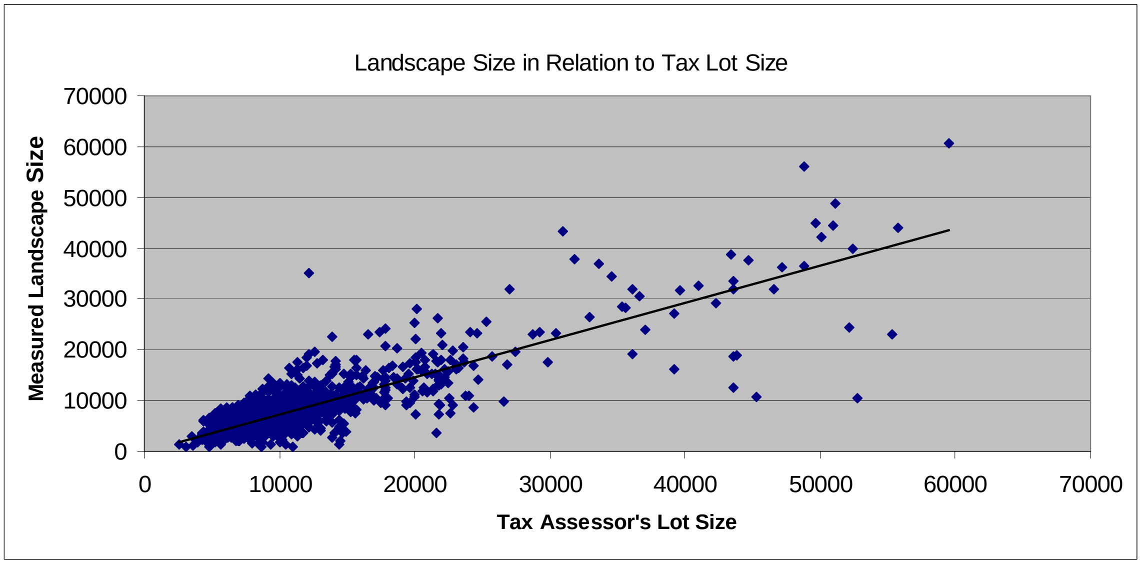
The regression equation is as follows:

L = 8 + .73(A)

L = Irrigated Landscape Size in square feet
A = Tax Assessor's Recorded Lot Size in square feet (multiply acres by 43,560 to get sq. ft.)

The regression equation is surprisingly simple. It is telling us that the average lot in Salt Lake County is about 73% of the recorded tax lot size. If we apply this to the data shown in graph 1 we can now see **graph 2**.

Graph 2



The regression equation has an R-squared value of 71%. This tells us that 71% of the variation in the data is defined by the regression equation.

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[3] Statistics for Business and Economics; Heinz Kohler, 2002. Chapter 17.
[4] Regression equation was computed using "MiniTab" statistical software

Variance in observations can be explained several ways. The first being personal preferences in landscaping. Looking at the graph we see that the smaller lots are grouped closer to the regression line while the larger lots become more sporadic. One explanation for this is that smaller lots are more confined and have less leeway in landscaping choices. Larger lots have a lot more variety in landscaping. Some larger lots choose to have larger houses and driveways which make landscape smaller. Others have smaller houses and most of the lot covered with grass.

Some of the variation in the data can be described by recording error. County tax assessor's information is not always 100% accurate. We noticed many lots that were obviously larger than .5 acres recorded as .1 acre or less. These records that were obviously wrong were thrown out of the study. We assume that there are many minor differences that can not be detected.

Variation can also be explained by landscape measuring techniques. Lot sizes were measured by a dozen different USU interns. Before the program starts each year, interns are all given the same training on how to measure lots. However, this does not mean that each intern ends up measuring the same way.

Possible Applications

The *Slow the Flow* program will use this information to estimate how much water people who did not have a water check are using. Water savings are based on a comparison of how much water everyone else is using. With the help of water retailers we pick random lots in the city and compare water use. Because we do not measure these lots, this study will help us determine landscape size, and thereby calculate water use according to the turf water requirement, for any given resident.

Many cities in Utah are trying to manage water use by creating tiered water pricing structures. One such example is Salt Lake City. In Salt Lake City a resident pays $.72 for each ccf (thousand cubic feet of water, approximately 748 gallons) of water used, as long as they use less than 9 ccf. If the resident uses more than 9 ccf they pay $1.10 per ccf in excess of 9. If they use more than 29 ccf they are charged $1.53 per ccf in excess of 29. The problem with a tiered pricing structure is that it penalizes those people with large lots that may be trying to save water, while not punishing smaller lots that may be wasting large amounts of water. Instead of pricing water in tiers according to total gallons, cities could base pricing on a lot's given landscape size. This landscape size would be based on the lot size designated by the tax assessment. Because the data describes the average, it will not be completely accurate but will be fairer than current pricing structures.

As cities instigate customized pricing structures, residents will become more concerned about accurate tax assessor lot sizes. Help in correcting inaccuracies in recorded lot sizes would help county tax assessors make a better accounting of property taxes.

Conclusion

Our research can be used as a model for other counties and cities in the United States to determine landscape sizes based on tax assessor's lot sizes. We would expect the percent of landscape verses recorded lot size to change in different cities across the US. Due to the linear nature of the relationship, a few accurate lot size measurements can be made to create a case specific regression equation.

With a case specific water pricing structure, cities could more effectively reward people for water conservation efforts. Such a pricing structure would also allow water retailers to capture profits from water wasters.

As the *Slow the Flow* program progresses, so will the number of observations added to this research. As we add more observations, we hope to make an even more accurate regression equation. It is also our hope that more counties across the nation will contribute to our research.