SNWA Rate of Play Study Using GPS: Finding Turf to Convert

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Abstract

In response to historic drought and subsequent regulatory action, golf courses in the Las Vegas area have converted over 38 million square feet of grass to water efficient landscaping in areas generally not impacting the playability of the course. The authors present how a method developed by Mr. Jim Moore of the USGA and adapted by the Southern Nevada Water Authority is helping courses to identify further areas that may be considered for conversion by tracking volunteer golfers on courses with inexpensive GPS recorders. The technique provides for far more sophisticated analyses and helps to evolve conversations from one of simple water-centric landscape conversion considerations to discussions of truly optimizing courses' design from a paradigm of functionalism with consideration of numerous inputs. The presentation will provide additional information about the method and annotated aerial imagery demonstrating its application.

Keywords

golf, GPS, turf removal, landscape conversion, xeriscape, conservation, sustainability, turf grass

Background

In 2003, in response to a drought of historic proportions on the Colorado River, the Las Vegas area's main water supply, the Southern Nevada Water Authority (SNWA) passed its Drought Plan. For this sector, conservation staff and community leaders determined that the day-of-week and time-of-day watering restrictions that worked for most of the community would not be practical for the golf course sector. They, in an occasionally contentious but ultimately collaborative effort with local course owners and superintendents proceeded to develop water budgeting policies that would result in significant water savings while maintaining needed flexibility in scheduling irrigation.

Upon activation of the plan by SNWA's Board and subsequent passage by its member stakeholder jurisdictions, golf courses faced first a budget threshold of 6.5 acre-feet per irrigated acre for Drought Watch then, as the drought worsened to Drought Alert it dropped to 6.3 acre-feet per irrigated acre. Penalties for going over the budget were dependent on the extent to which a course went over the threshold and the penalties were applied to this fraction. They ranged from as little as 2x the highest tier rate paid by the course up to 9x.

The water budgeting policy was designed to impact courses with the highest per unit area irrigation (with public supplies) while rewarding the majority of courses that were already earlier adopters of efficiency techniques. The drought dragged on and eventually in 2009 the community, having become accustomed to the restrictions in the Drought Plan, decided to place almost all of the restrictions into perpetuity, including golf course water budgets.

In addition to providing a regulatory framework designed to encourage courses to save water during drought, the founders of the Plan wanted to make those savings as assured and long-lasting as possible. To this end, the water budget was intentionally based on irrigated acreage as set at the time of drought level imposition (or construction for newer courses), not grass acreage. This permitted golf courses to be able to derive significant tangible benefit from conversion of low and no value grass to water efficient landscaping in generally non-play portions of the course. This is in contrast to approaches that, perhaps inadvertently, end up failing to reward and perhaps even penalize courses that implement what is often the strongest conservation measure by basing the budget on grass acreage.

The superintendents and owners responded resolutely with a number of strategies, turf reduction being one. Since the drought, Southern Nevada golf courses have become the most prolific converters of grass in the region. Collectively they have converted over 38 million square feet since program inception, the bulk of this coming after the Drought declarations and subsequent water budgeting policy implementation. In totality the landscape conversions alone are estimated to save over 2 billion gallons of water annually in this sector. Courses achieved this by finding convertible turf in low use or nonfunctional portions of their properties. In many cases this turf had served only aesthetic purposes and impacts on rate of play were very low to nonexistent. SNWA has been supportive of the golf courses in their turf reduction efforts and has provided over $39 million in landscape conversion rebates to courses over this time.

Eventually golf course conversion rates waned somewhat, with new conversions dropping below 1 million square feet per year in 2011. This was to be expected given economic distress in the community and the fact there is only so much grass available without getting into the common places golfers end up which could potentially impact the experience and rate of play, a crucial consideration for any course. In informal communication both SNWA staff and superintendents expressed their belief there was more turf conversion to be had in low use areas, but that determining where this was represented a challenge.

Method

As turf conversion was starting to taper off, SNWA staff became aware of research by the USGA's Dr. Jim Moore who was thinking about speed of play and helping courses to align with the changing landscape design ethic emphasizing the functionalism of various landscaping choices at courses. The USGA broadly recognized that a sustainable course in the future would be one where the landscape was coupled with the needs of both it and the community.

Dr. Moore developed the idea of using Geographic Position System (GPS) data as a means to solving the question of what parts of a course are used and what is not. He conceived of the idea of providing golfers that volunteered to participate with a small GPS recorder that they would carry in their pocket.

GPS dataloggers intended for fitness activity tracking, with their combination of durability (water resistance and shock), configurable data collection resolution and storage capabilities, +/- 2.5m accuracy, durability, and relatively small size, were found to be ideal. Upon return, the data was downloaded and the GPS records were used in conjunction with Geographic Information System (GIS) software and aerial imagery to plot the path the golfer(s) took on the course. With sufficient sample size he could develop a detailed picture of areas most and least used. The technique is elegant in its simplicity.

Once the paths are plotted and visualized with GIS software, the technique lends itself to further analyses to help reveal potential areas for alternative landscape treatments. With logical exceptions for the driving range, water hazards and such, turf areas where golfers never go are logical initial favorites for consideration. Next, areas rarely seeing golfers can be considered. For example, an area where only 2% of golfers go, might be better as rough than as maintained turfgrass. Now, with the areas of where golfers go revealed and the speed of play recorded, the Superintendent can start to consider the impacts of landscape conversion with an eye towards minimizing the impact of landscape conversion.

Combined with other information such as survey data, more advanced questions can be considered such as to what extent should a hole favor or disfavor golfers of a certain handicap level? Does the placement of greens align with the needs of golfers of a variety of stroke strengths? What holes do golfers unexpectedly slow down on and how might course modification improve this?

It should be noted that Dr. Moore's research in this area is not limited to just study of golfers. He has, with courses' permission, explored the maintenance aspects of areas too. The same technology can be used for tracking time devoted to an area for maintenance (where the GPS unit is carried by staff), time required for mowing (here, putting a unit on a lawn mower) and relative efficiencies of different mow patterns, and quantification of benefits of technology upgrades (for example, upgrading to a new mower). The list is only limited by the imagination and the reception of the tracking units.

Evolving the Discussion

When all this information is put together and combined with other data courses usually have, such as their water bills, per unit labor expenses, fertilizer costs and similar variables, the result is a powerful tool for building scenarios. These then can be analyzed and compared. Ideas can be developed and reimagined as the course management looks critically at the value of the various land areas.

Perhaps most importantly, this level of value scrutiny starts to move the conversation for superintendents and owners from the relatively modest goal of "Where can I remove grass to save water at my course?" to "How can I optimize the design and operation of the course to make the best use of the resources I invest in it?" They start to discover more benefit than the water savings alone suggests and they start to take realize innovative approaches distinct of the original discussions about water conservation.

While on balance the outcome of this work is supporting landscape designs for water conservation, it may be that in some places, the research shows that grass should remain or even should have remained from a course function perspective. That is fine. The point is that now there is a technique that provides superior abilities to consider suitability of the plantings. While most superintendents in the Las Vegas

Valley demonstrably had, and still have, an excellent feel about where to convert the bulk of their courses less functional turfgrass areas, cooperatively with SNWA, the opportunity exists to achieve further landscape conversion without negatively impacting the experience or the playability of the course.