



## Handling Hard Water

*Profile's ProPlus® Aqua-pHix™ works twice as well as the competition to improve soil conditions at Vistal Golf Club*



### Hard Water, Desert Soil and Drought

Arizona golf courses battle some of the hardest water in the nation, and the Vistal Golf Club is no exception. Combine hard water with a drought and you have very difficult conditions for a course superintendent. Successful water management practices are critical to ensure guests enjoy great greens and tees.

Nestled at the base of South Mountain in Phoenix, Vistal Golf Club offers championship golf surrounded by amazing views of the downtown area, Camelback Mountain and Squaw Peak. Completely redesigned and rebuilt in 2000, Tim Cooper, golf course superintendent at Vistal Golf Club,

has fought the effects of hard water on his USGA greens for years.

In order to keep his TifDwarfBermuda grass alive and well, Cooper must decrease the levels of bicarbonate and sodium in his soils, increase nutrient levels and encourage drainage.

### Less Sodium, More Nutrients

Irrigated with hard water, course soils assume characteristics of the water supply. Over time the irrigated soil can form bicarbonate, which causes soil sealing and increased alkalinity, preventing water infiltration

and locking up nutrients such as nitrogen, phosphorus, potassium and others needed for healthy turf establishment.

As Cooper's greens were very high in bicarbonates and sodium, he struggled to keep them alive and healthy. The soil at Vistal Golf Club had some of the highest sodium levels in the city and eight years previously, the course greens almost died due the high concentration of sodium in the soil.

Soil tests completed by the Motzz Laboratory showed the baseline electrical conductivity rates were also high, as well as the calcium and sulfate levels. Additional tests showed low sulfate levels in the irrigation water compared to the levels in the soil. Sulfates were coming from cultural practices using sulfur burners which negatively affect soil.

### Aqua-pHix™ and Flush

Cooper's solution must successfully handle the hard water and the dry desert region. To manage excessive bicarbonate, sodium and calcium in his greens soil, as well as to reduce sulfur levels in the irrigation water, Cooper needed to apply water treatments regularly, incorporating ProPlus® Aqua-pHix™ Spray Formula. These treatments improve soil conditions by flushing out unwanted salts and bicarbonates.

Two independent laboratory comparisons prove it requires half as much Aqua-pHix to hit target bicarbonate levels versus a leading competitor. The proprietary formulation of self-buffering, chelated organic and inorganic acids of Aqua-pHix is designed to help manage alkaline soils. More effective and easier to use than any other acidifier on the market, it is the most cost-efficient treatment

available. The ProPlus Aqua-pHix Spray Formula ensures nutrients are readily available in the soil solution for plant uptake and conversion. It also loosens soils to improve water infiltration and facilitate more complete nutrient utilization.

Due to the pH of the irrigation water in the region, the greens required two applications at a rate of seven gallons of Aqua-pHix per acre. Beginning in June of 2008, Cooper first sampled soils from green number one and green number eight, a problem green set in a canyon. The next day, he made his first application of Aqua-pHix to all of the greens on the course, followed by a flushing at night. A few days later, Cooper took another soil sample of greens one and eight.

After four weeks, Cooper made his second application of Aqua-pHix Spray Formula on all of his greens at a rate of seven gallons per acre. He followed with an evening flushing of the greens. After a couple of days, he retested the soils of greens one and eight.

## Acid Relief

The results were crystal clear. After applying Aqua-pHix, the electrical conductivity levels previously at 2.6 on green number one, had dropped to .77 mmhos/cm. Sodium decreased from 560 to 230 ppm and sulfate levels dropped from 430 to 51 ppm.

Green number eight, the problem green, showed the most improvement as electrical conductivity dropped from 7.5 down to .67 mmhos/cm, sodium dropped from 370 to 230 ppm and sulfate levels went from 180 down to 37 ppm.

“We are seeing a much better water flow,” said Cooper. “The greens drain better and we have much less puddling. We are also seeing a better response in regard to nutrient levels. Also,

### Lab 1 – Water Titration Test

Target pH	Aqua-pHix		Leading Competitor	
	ml Required to hit Target	Resulting Bicarbonate (ppm)	ml Required to hit Target	Resulting Bicarbonate (ppm)
8.19 (Baseline)	0	282	0	282
6.5	3	202	6	190
6.0	6	125	12	108
5.5	8	87	16	58

### Lab 2 – Water Titration Test

Target pH	Aqua-pHix		Leading Competitor	
	ml Required to hit Target	Resulting Bicarbonate (ppm)	ml Required to hit Target	Resulting Bicarbonate (ppm)
7.0 (Baseline)	0	355	0	355
6.5	2	286	6	270
6.0	6	235	13	194
5.5	11	110	21	83

### Soil Test

	Green #1			Green #8		
	Before	After	% Reduction	Before	After	% Reduction
EC	2.6	0.77	70.4%	7.5	.67	91.1%
Sodium	560	230	58.9%	370	230	37.8%
Sulfate	430	51	88.1%	180	37	79.4%

while irrigation levels have remained consistent on most of the course, we are saving water on the greens. The grass is holding water better.”

Amending with new ProPlus Aqua-pHix, the pH, bicarbonate, sodium, and calcium were greatly reduced in the water Cooper was applying. In turn, this water reacted positively with the soil chemistry resulting in good plant health, playability and improved aesthetics of the greens. Additionally, the new levels of sulfur reflect the benefit of using a non-sulfur-based acidifier like Aqua-pHix.

Cooper continues to use Aqua-pHix to maintain the healthy nutrient levels of his soil. Approximately every month, he applies five gallons of product per acre and follows by flushing the greens.

Healthy soils and turfgrass depend on pure water for their metabolic process. As long as hard water is present, soil issues will result. By amending hard water with new

### Water Analysis – Irrigation water used during trial period

	ppm
pH	8.4
Bicarbonate	266
Calcium	70
Sodium	336
Magnesium	23
Sulfate	64
SAR	8.8

Aqua-pHix, pH is greatly reduced improving seed germination, key nutrients are released and the solubility of calcium increases to enhance fertilizer efficiency, water penetration and drainage.

More effective than any other spray acidifier on the market, Aqua-pHix is the most cost-efficient treatment available. Proven safe for people, equipment and turf, it is offered in granular, spray or fertigation formulas. Aqua-pHix successfully manages hard water and highly alkaline soils two times better than the competition, and easily handled the hard water at Vistal Golf Club.