

This presentation premiered at WaterSmart Innovations


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Golf Course Water Use Under Water Budgets

- **Mitchell Morgan**
- **Kent Sovocool**

History of Water Budgeting

- ▶ SNWA Drought Plan
 - ▶ Initial Analysis
 - ▶ Eventual Budget
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A Review of History of the Drought

- ▶ Mid 2002 – SNWA recognizes first signs that we are in the most severe drought ever observed in the Colorado River Basin.
 - ▶ Drought mitigation planning commences.
 - ▶ January 2003 – Following scoping sessions and input from the community, SNWA releases the Drought Plan.
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Inner Las Vegas Bay Looking Northwest



March 7, 2000, elevation 1213 Feet




April 11, 2002, elevation 1170 Feet


Historical – SNWA Drought Stages

Southern Nevada Water Supply Status			Lake Elev.
Stage	Suggested Trigger At Time (Obsolete Now)	Water Availability from Colorado River	
No Drought	A full domestic surplus, quantified surplus or flood control operating condition is declared by the Bureau of Reclamation (BOR)	All Southern Nevada's customer demands can be met, even if greater Than 300,000 AFY basic apportionment	
Drought Watch	There is over 50% chance that the BOR will declare a partial domestic surplus operating condition in their next official declaration	Potential that only ½ of Southern Nevada's customer demands greater than 300,000 AFY can be met in the following year	1145 ft.
Drought Alert	A partial domestic surplus has been declared by the BOR <i>or</i> There is over 50% chance that the BOR will declare a "normal" operating condition in their next official declaration	Only ½ of Southern Nevada's customer demands greater than 300,000 AFY can be met, with potential for further reduction in the following year.	1125 – 1145 ft.
Drought Emergency	"Normal" operating condition (or less) exists	Southern Nevada can only meet customer demands equal to basic apportionment of 300,000 AFY, or some lesser amount to be defined by the circumstances	<1125 ft.


Determining Budget Limits

- ▶ Goals were initially determined in the 2003 Drought Plan
 - During Drought Watch, the water budget will be established at the 90th percentile of past use.
 - **This meant that there will be a significant financial incentive for conservation of the top 10% of the golf course industry's water use.**
 - Under Drought Alert, the budget will be established at the 80th percentile.
 - **That is there would be incentive to conserve the top 20% of use.**
 - As this budget model would always be based on the original irrigated acreage (not turf area exclusively) it encouraged and rewarded turf conversions.
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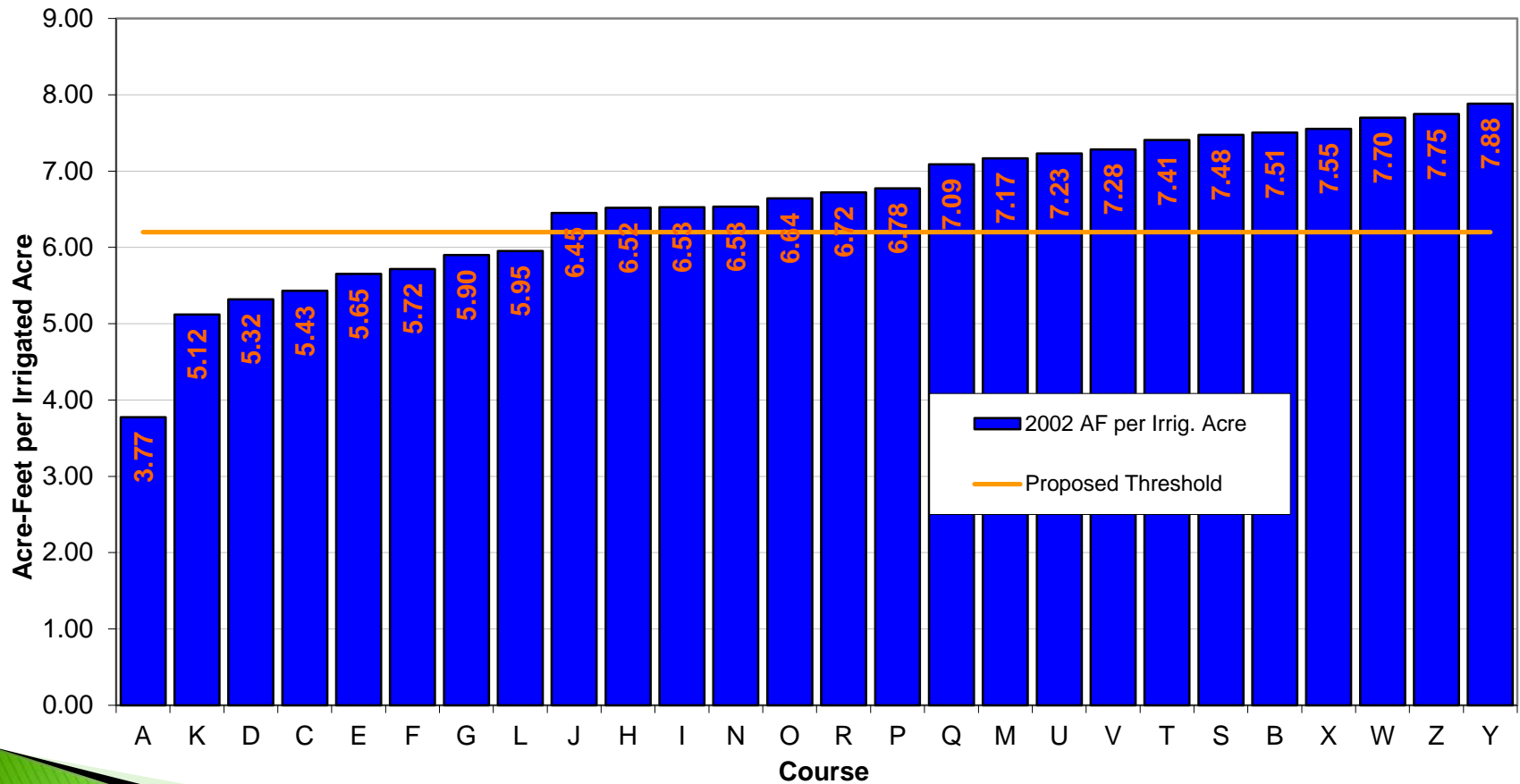
Industry Buy-in

- ▶ Before the water budget number set SNWA had discussions with GC representatives.
 - ▶ GC Industry – let us try a plan based approach to conservation at our courses.
 - ▶ SNWA and industry agreed to try plan as a supplement to water budgets and a less stringent limitation number than originally predicted mathematically.
 - ▶ Courses were required to submit their own water conservation plan.
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Plan Elements

- ▶ Physical description, esp. all irrigated areas.
 - ▶ Itemized accounting of 2002 water use.
 - ▶ Review of spray irrigation efficiency.
 - ▶ Description of key water use reduction strategies.
 - ▶ Timeline for implementation of strategies.
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Budget Impact Assessment




Water Budget

- ▶ In 2004 all golf courses that used water from the municipal supply were subjected to an annual budget of 6.5 acre–feet per irrigated acre limit which was then later adjusted to 6.3 in 2005.
- ▶ If a course exceeded this budget then they were subject to a financial penalty.

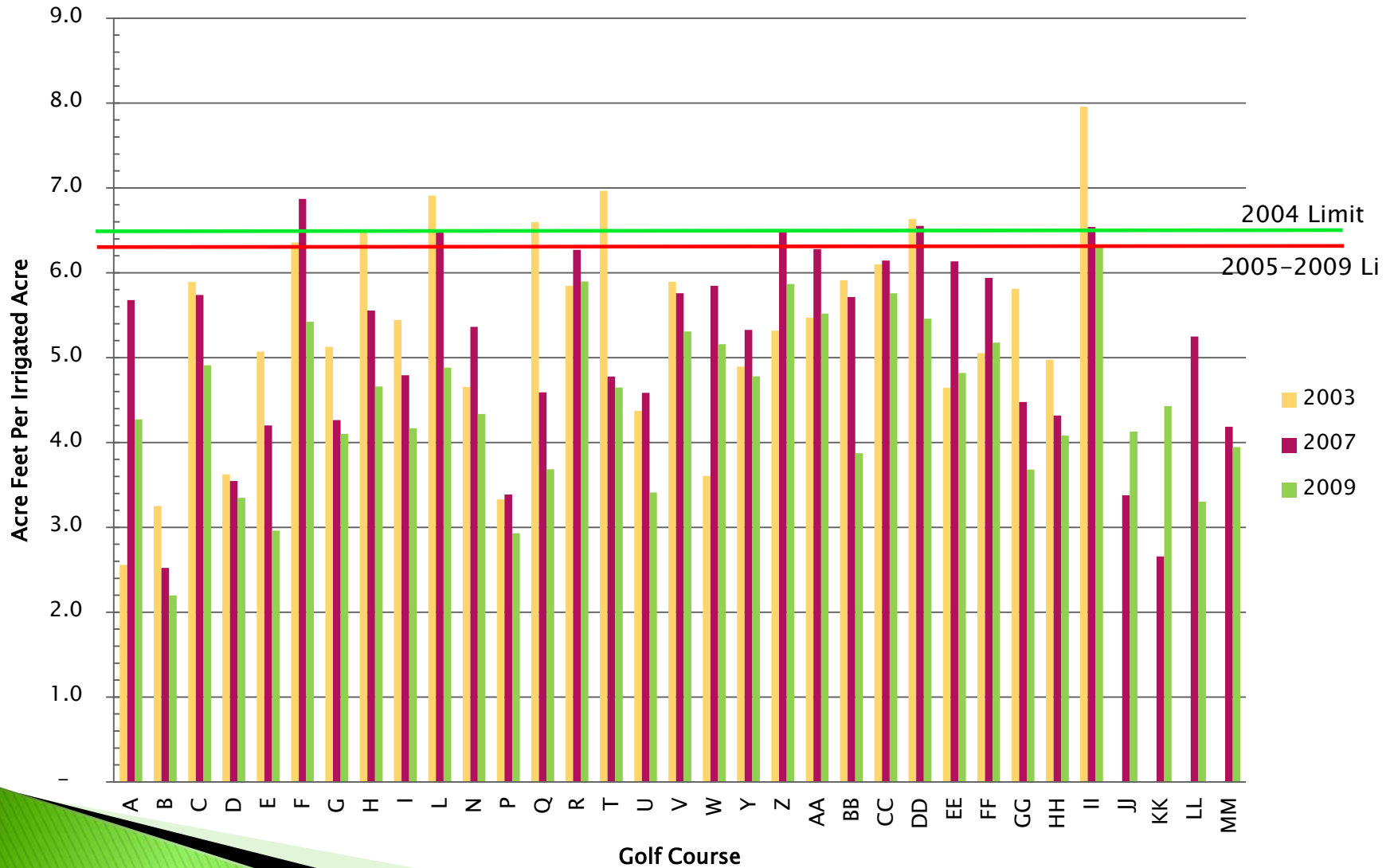
Percent of Budget	101 – 120%	121 – 140%	>140%
Proposed in 2003 Drought Plan	Excess charged 2 x Top Rate Paid	Excess charged 4 x Top Rate	Excess charged 8 x Top Rate
Current (Drought Alert)	2 x Top Rate	5 x Top Rate	9 x Top Rate

Budget Compliance

Evaluation Objectives


- ▶ Determine the compliance rates for the courses
 - ▶ Calculate the overall water savings
 - ▶ Assess the impact of turf conversions on water use
 - ▶ Evaluate vs. Drought Plan Goals
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Golf Course Use vs. Budget Limits

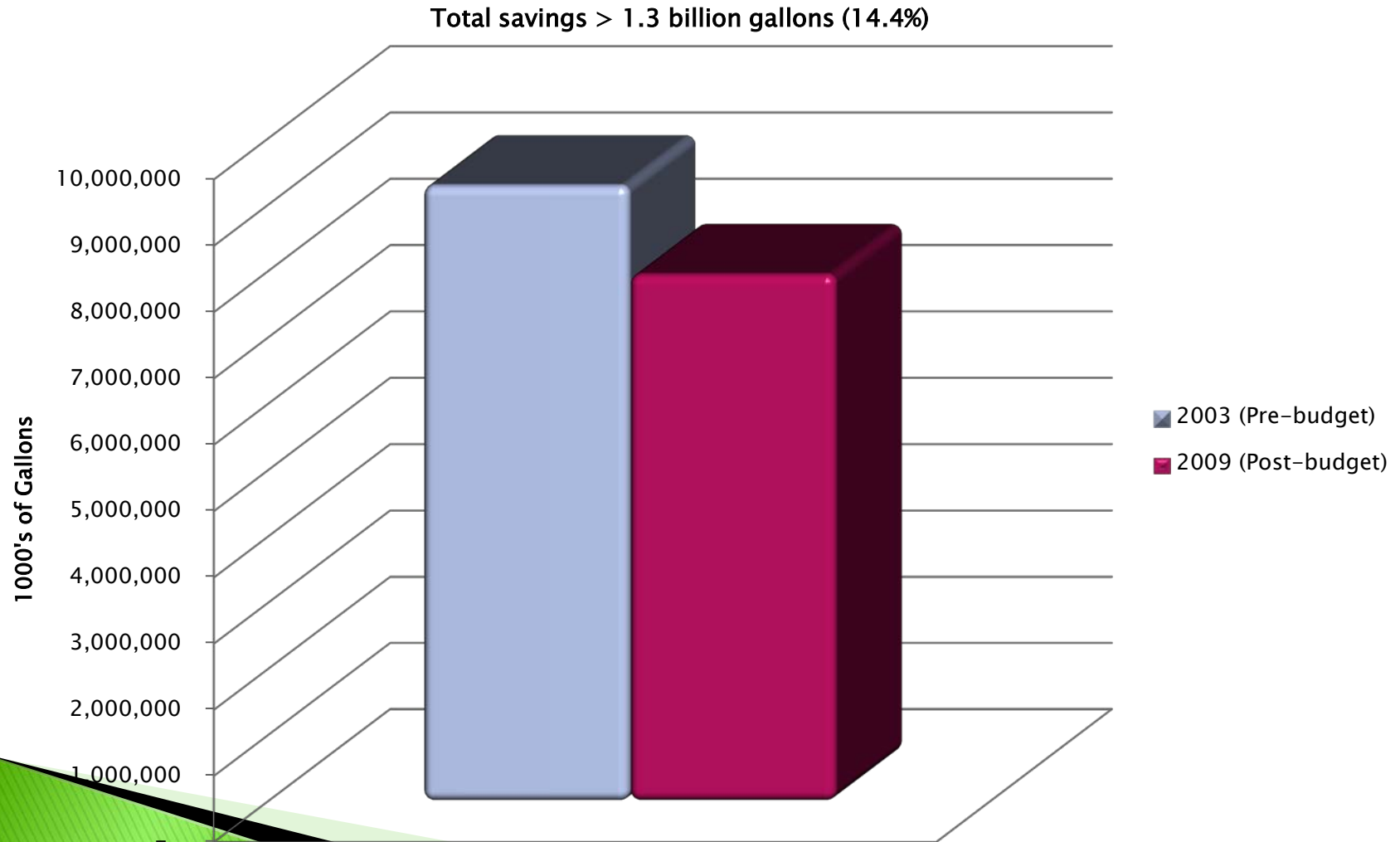


Results – Compliance

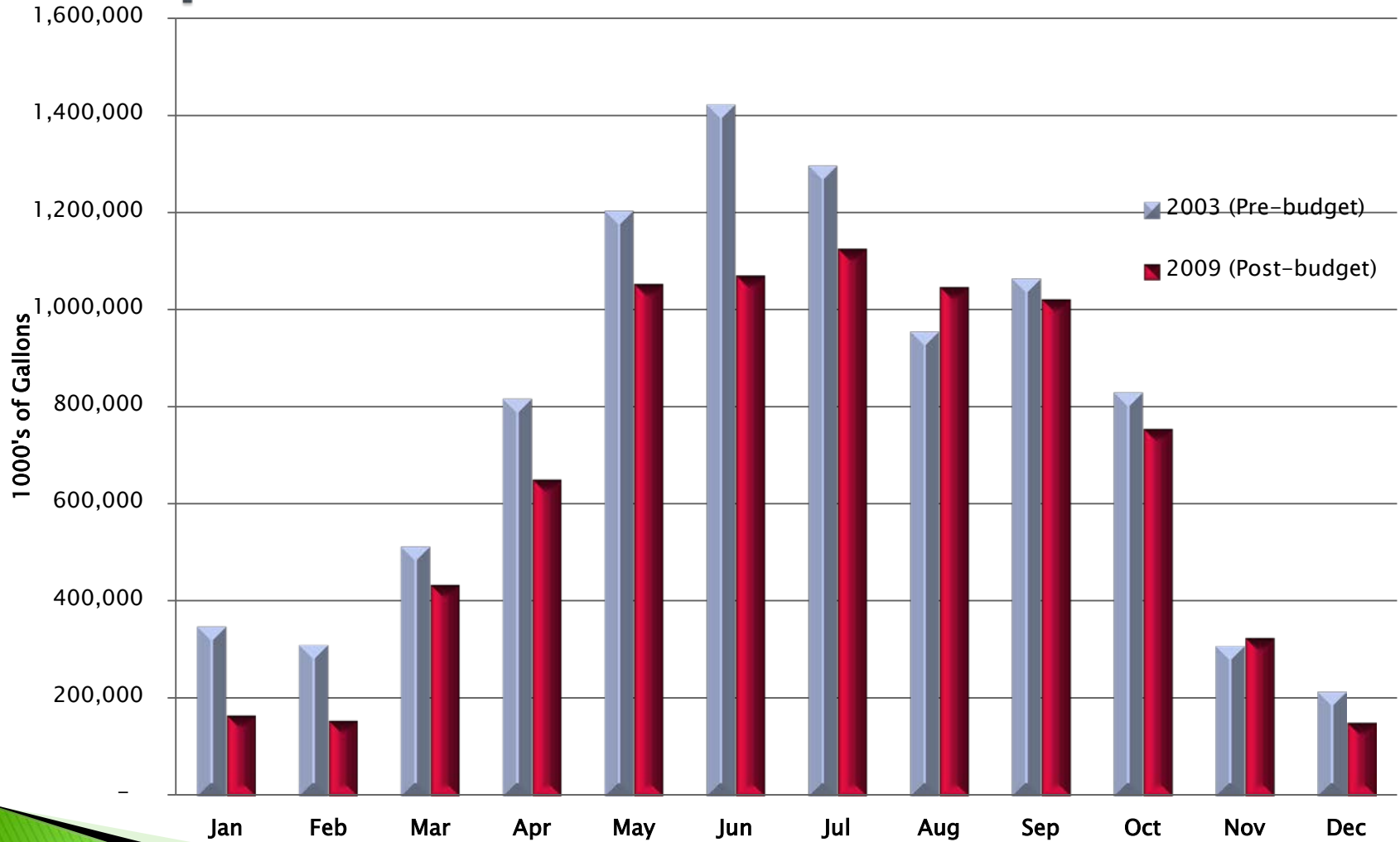
Overall the courses were very compliant with their budgets, most years with all compliant courses or only a couple exceeding their limits.

- ▶ Five courses overspent their budgets in 2007
 - ▶ All but one course resumed compliance for 2008 & 2009.
 - ▶ The courses that went over their budgets did minimal or no turf conversions at all.
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Decrease in Water Use of Courses Subject to Water Budgets



Pre vs. Post Budget Monthly Comparison



Conversion Areas

Obviously Grass is necessary as a play surface, but there are often lots of areas that have grass but aren't necessary for the game:

Parking Lots
Frontage Areas
Clubhouses and
Other Facilities



Conversions



Out of Bounds



Near Surrounding Residences

Pre / Post Comparison

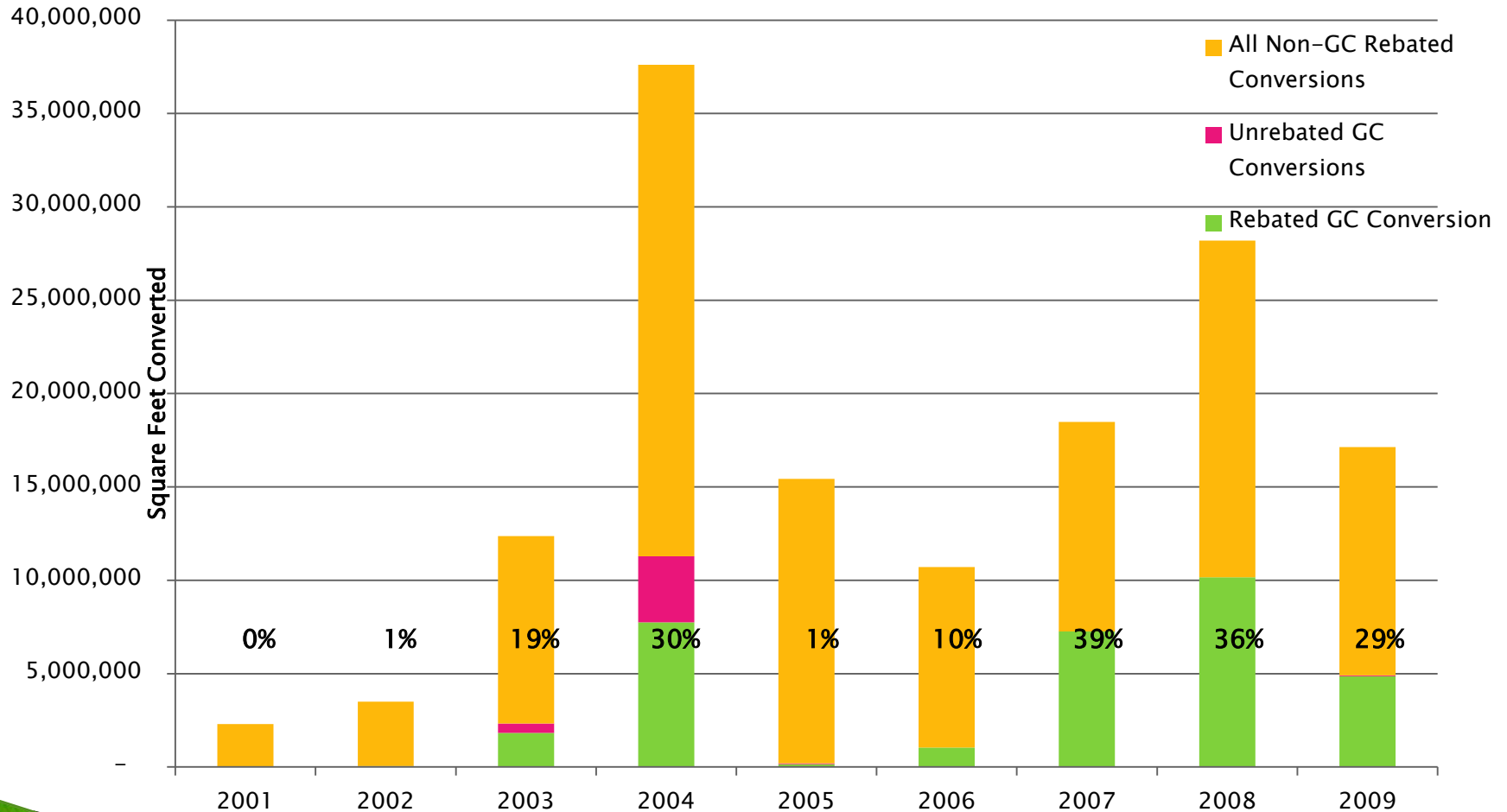


Before



After

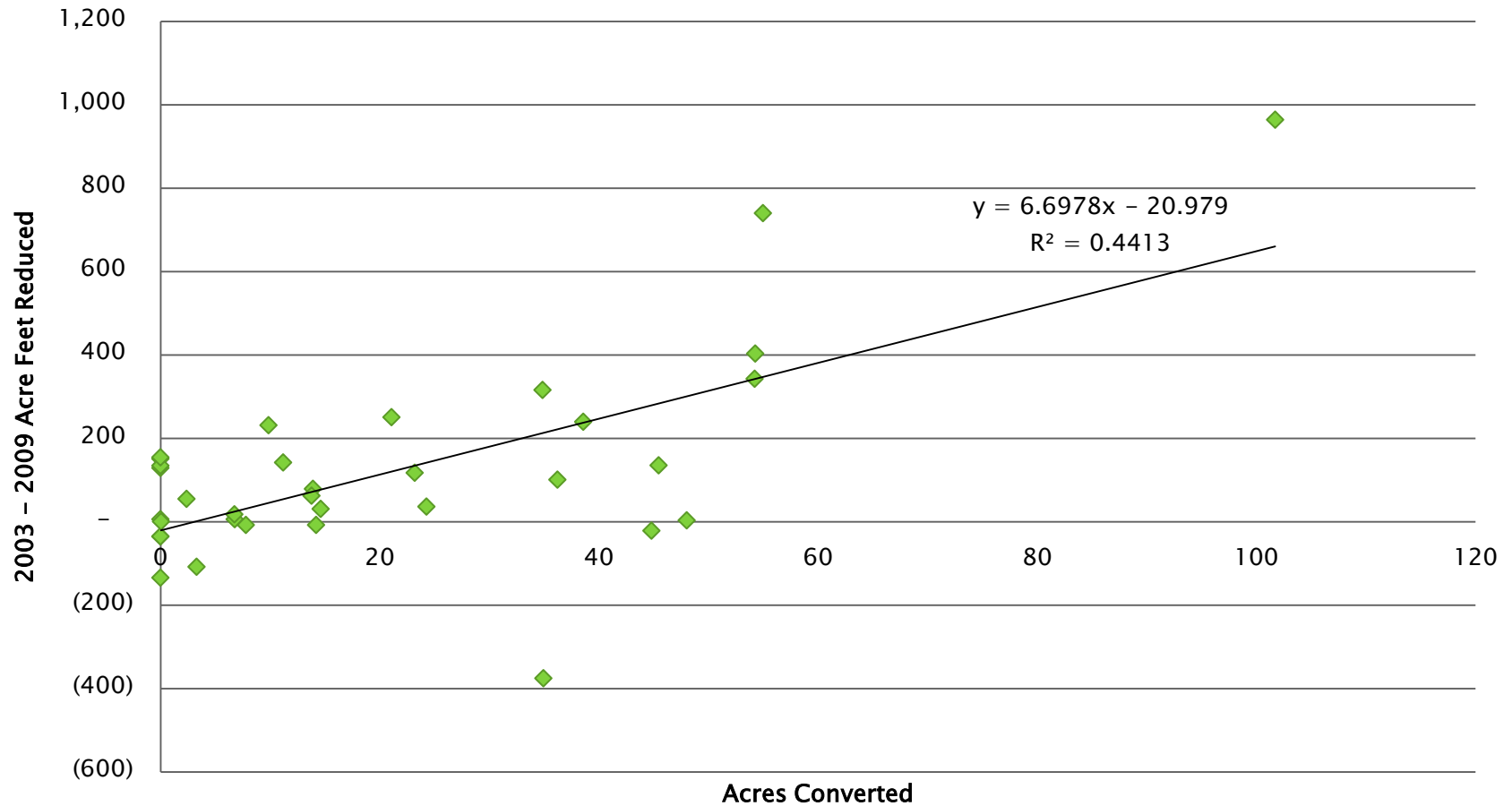
Golf Course Conversions vs. All other Sectors



Percentages are for combined rebated and un-rebated golf course conversions

Total Conversions vs. Savings

Roughly 34 gallons per square foot



T-test for Dependent Samples $p < .014$


Conclusions

To directly assume the reduction is due to water budgets alone would be an oversimplification. Other factors include:


- ▶ The increasing cost of water over the timeframe
- ▶ Greater scrutiny by the public
- ▶ Improvements in technique and technology
- ▶ Large scale landscape conversions are likely to have significantly influence the reductions observed

Water budgets, however, have certainly functioned as a major factor in decision making regarding water use on golf courses. The extent to which such changes are influenced directly or indirectly by budgets may be further revealed with the application of multivariate analytical work.


Conclusions

- ▶ Overall Water Budgets have been effective in reducing consumption. Annual use dropped 14.4 % for courses maintained over the study period.
 - ▶ This equated to a savings of 1.3 billion gallons annually.
 - ▶ By 2009 virtually all courses are in compliance with the budget.
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Conclusions

- ▶ With respect to the overall goal and the negotiated outcome:
 - The Industry did indeed make up more distance than might have been expected from a 6.3 acre-feet per irrigated acre limitation (they achieved 14.4% savings vs. the predicted 8.3%)
 - They exceeded the Drought Watch goal of 10% savings.
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Conclusions

- ▶ *Sustained* courses did not make the promised 20% reduction for Drought Alert.
 - ▶ It should be noted there have been substantial additional real-world reductions in consumption.
 - ▶ For the whole sector use in 2003 was 39,215 acre-feet (peak). This dropped to 30,986 acre-feet by 2010. This is a 21% reduction in consumption. Economic factors have played a role as well (including course failing).
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Questions?