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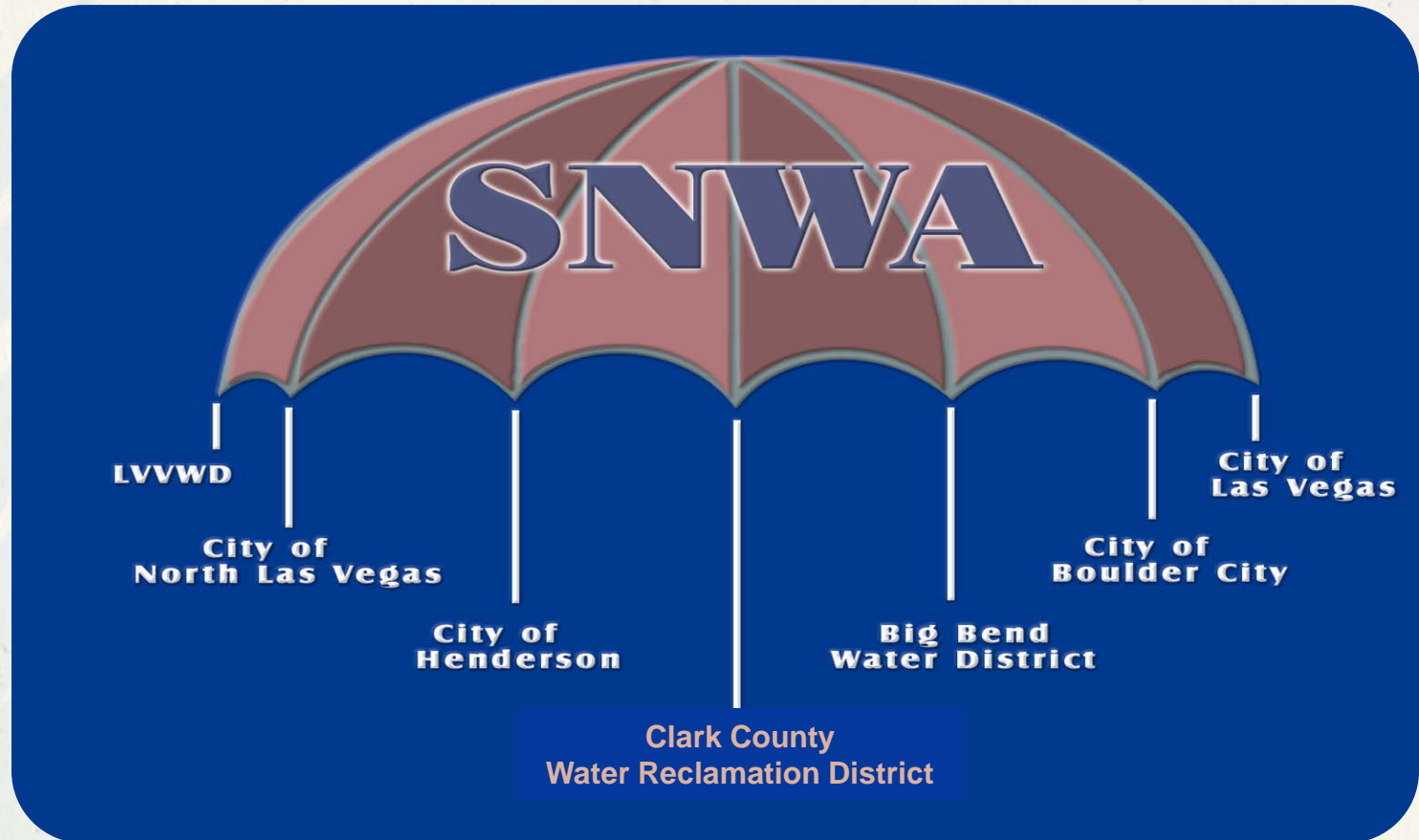


The Southern Nevada Water Authority's Pool Evaporation Assessment Study

An assessment of evaporative rates from single family residential swimming pools

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What is SNWA?



SNWA is the regional water wholesaler for the major municipal areas in Southern Nevada and is responsible for assuring adequate resources for these communities. Conservation is one of the major strategies employed to this end in addition to resource acquisition.

Background

- There are 105,769 in-ground single family residential swimming pools in Clark County as well as countless above ground pools.
- Pools are obviously a source of water loss
 - SNWA estimates using a pool cover can help save 10,000 to 15,000 gallons each year
 - Based on evaporative rates and pool usage



Evaporation Estimation

- Traditional method uses pan evaporation testing
 - 47.5” diameter cylinder with a depth of 10”
 - Water filled to 2” from the top
 - At end of 24 hour period, amount of water needed to refill pan is measured
- Currently SNWA uses a percentage of Evapotranspiration calculated using the Penman-Monteith equation to approximate actual evaporation
 - Weather station data used to make calculations
 - Calculated at roughly 90 inches per year on average



Limitations of Estimated Evaporation

- Pools and other larger bodies of water (i.e. lakes) could have a vastly different evaporation rate
 - Differences in water temperature, wind actions, and other microclimate influences
 - Currently some sources recommend multiplying pan evaporation rate by .75 to account for differences
- Pan evaporation rate is of limited use under certain rainfall events
 - Heavy, intense, and sporadic events
 - (sounds a lot like Las Vegas)
- Pool owners also subject their pools to different heating regimes (gas, solar heating) to extend the pool season, some use pool covers

Rebates and conservation

- Currently SNWA offers coupon program for the use of pool covers to reduce the amount of water lost to evaporation
 - \$50 or 50% off the purchase price of a tarp-like pool cover
 - \$200 or 50% off the purchase price of a permanent, mechanical pool cover, whichever is less
 - Residential customers of SNWA member agencies may redeem one coupon per property address every 36 months
 - Coupon printed at home and instantly redeemed at participating retailers
- To date, SNWA has redeemed over 32,000 coupons
 - worth over \$500,000
 - Saving an estimated 411,723,000 gallons
 - *Based on current model*



Objectives

- SNWA wanted to recruit a large number of single family residences to study and develop a better mathematical model of pool evaporation
- Study launched Spring of 2011
- Concluded Winter of 2012



Recruitment

- A list was generated using SNWA customers who had printed out, but not necessarily redeemed a pool cover coupon approximately 36 months before mid-point of study
 - SNWA emailed prospective participants to gauge interest then follow-up calls
- A coupon worth \$100 or 100% off the purchase price of a pool cover was offered as an incentive for participation
- Recruitment ended after 83 participants were screened and selected



Methodology

- Each property was subjected to an initial screening inspection
 - Explain the scope and purpose of study
 - Estimated study length at 1 year
 - Each property subjected to 4 pairs (8 total) inspections
 - Pool cover coupon delivered at conclusion of study
 - Have property owner fill out demographic survey
 - Take pictures of pool and equipment
 - Catalog variables
 - Pool deck and basin color
 - Above ground vs. in-ground
 - Calculate pool area and depth (if possible)
 - Sun exposure
 - Heating system
 - Fresh water vs. salt water



Methodology

- Initial inspection
 - Measure current water depth from pool deck
 - Deploy data loggers
 - Water temperature
 - Air temperature and humidity
 - Anemometer
 - Instruct property owner to not fill pool with water until follow-up visit or shut-off auto-fill device
 - No swimming until follow-up
 - Normal pool cover use encouraged
 - Leak detection using bucket in situ



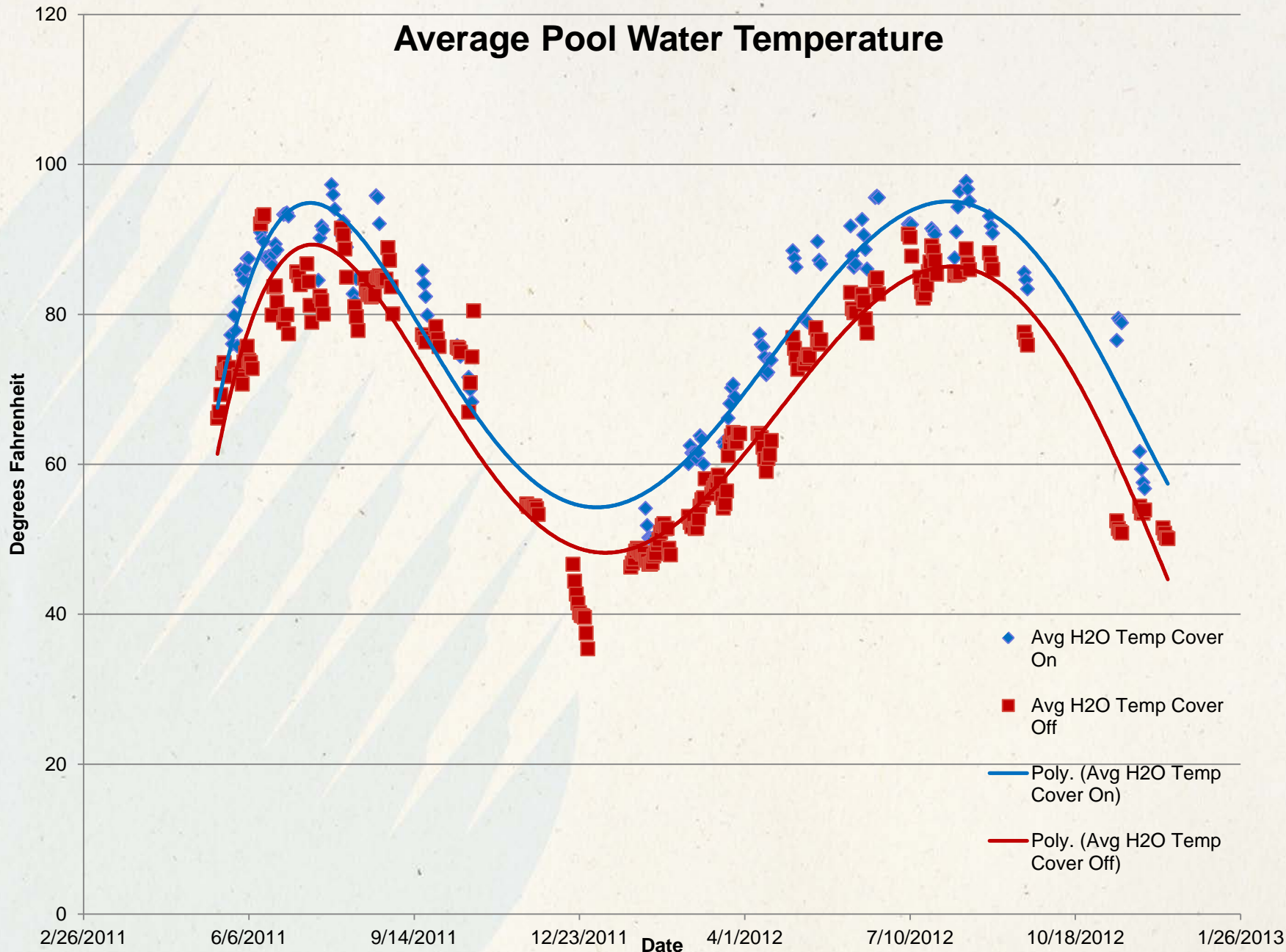
Methodology

- Follow-Up Inspection
 - 1 day after during peak summer season
 - Monday – initial, Wednesday – follow-up
 - 1 week after during rest of year
 - Monday – initial, Monday – follow-up
 - Record water depth from pool deck from same locations
 - Retrieve data loggers
 - Property owner back to normal pool operation

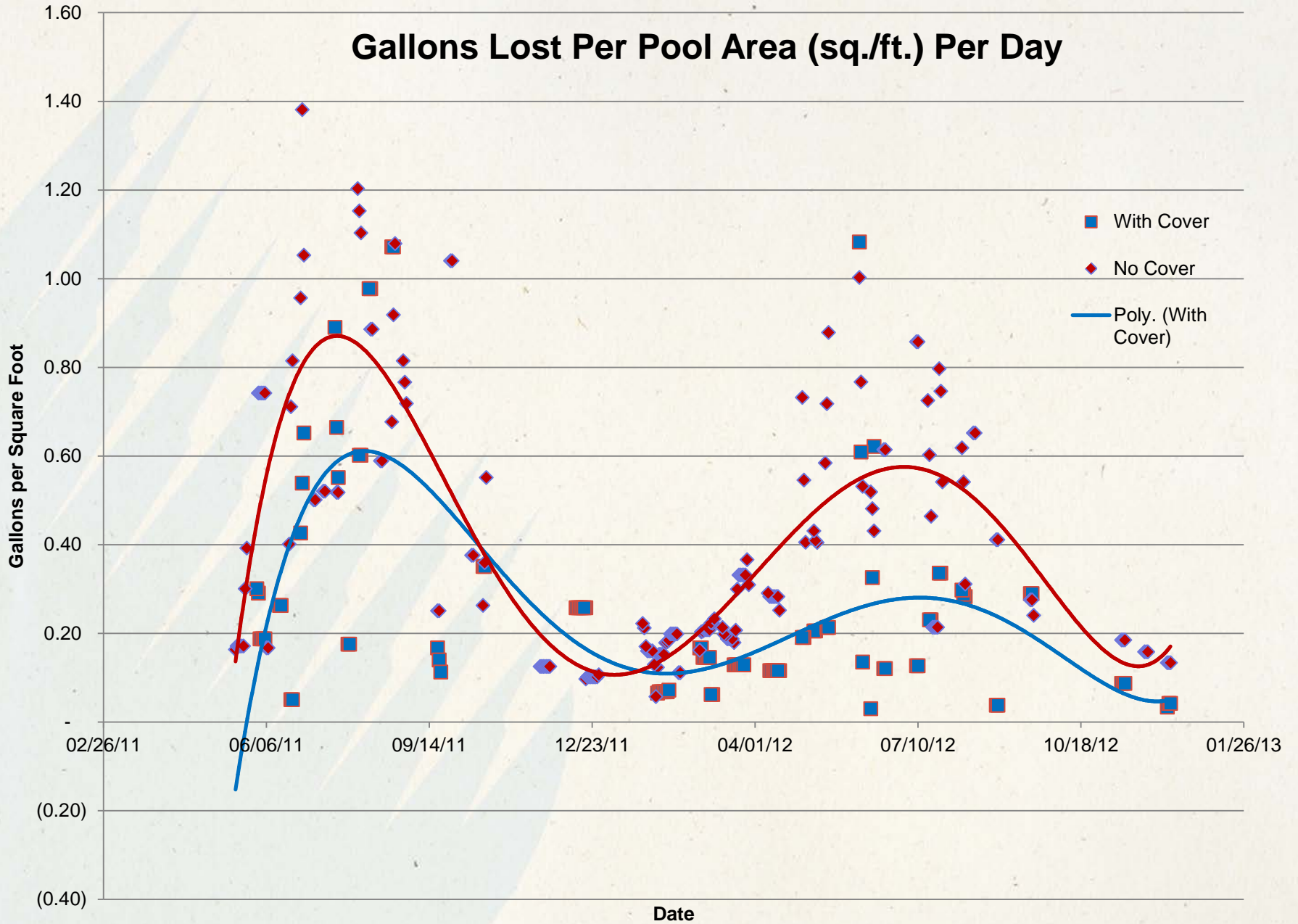


Results

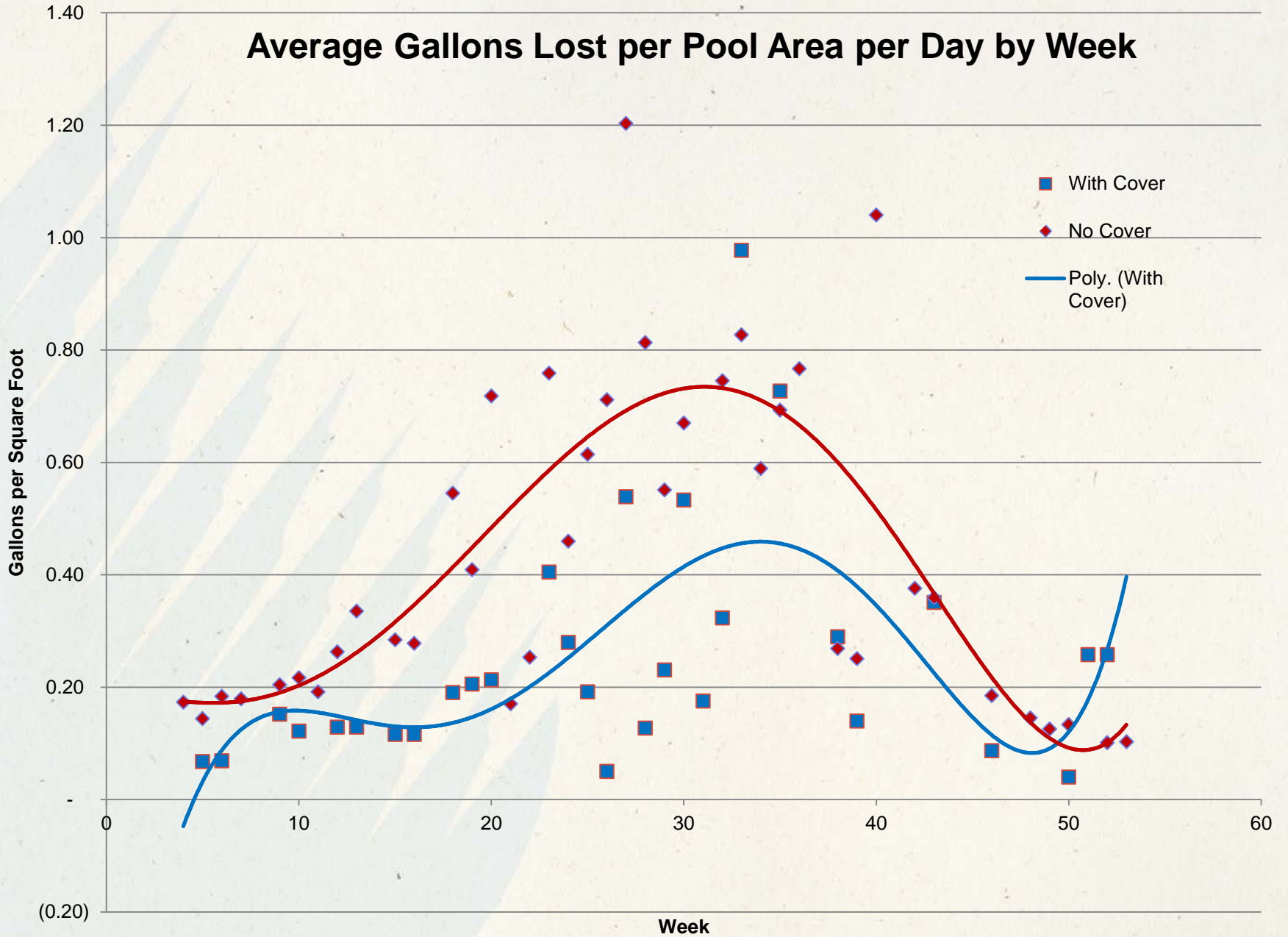
Average Pool Water Temperature



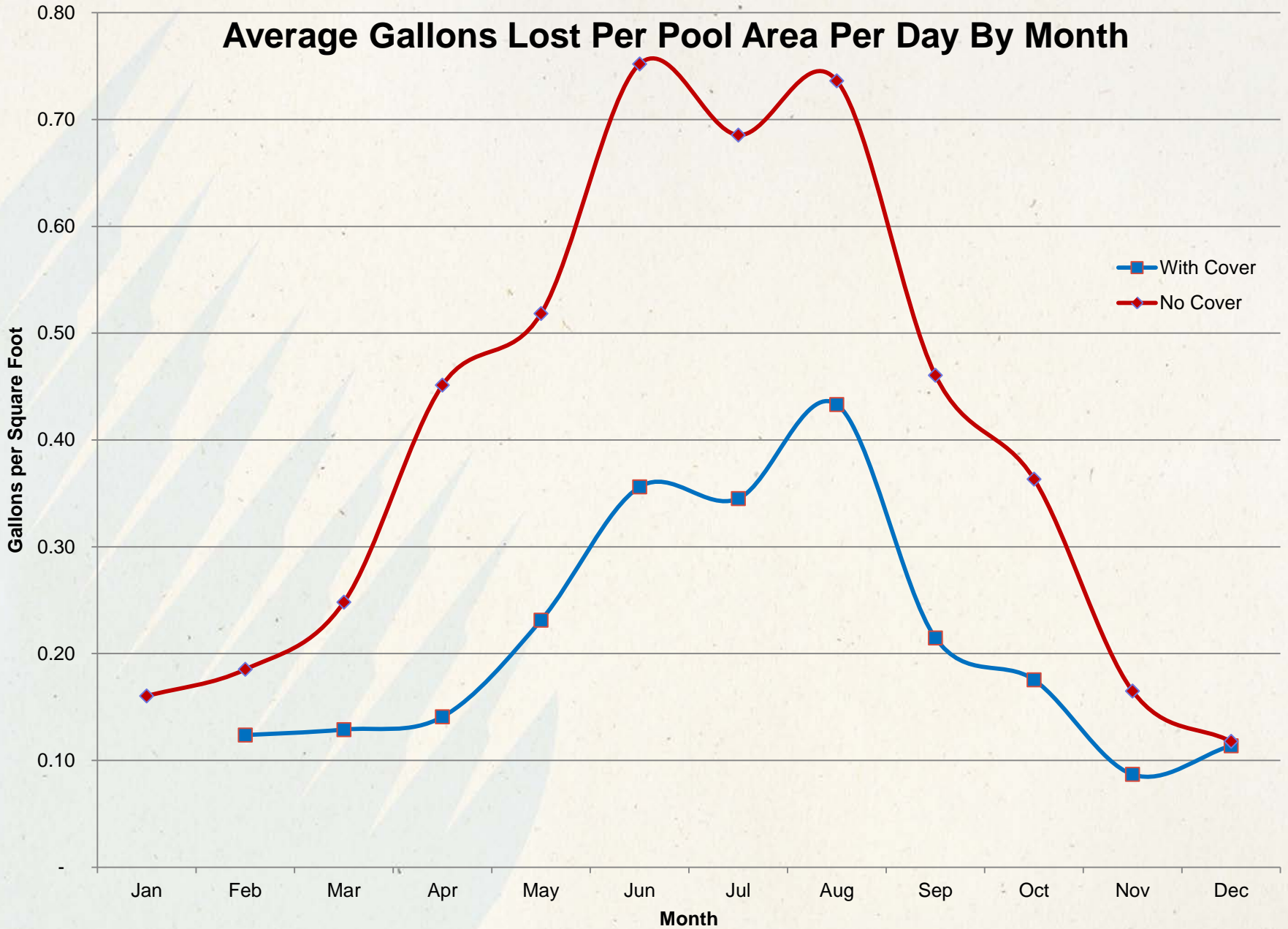
Gallons Lost Per Pool Area (sq./ft.) Per Day



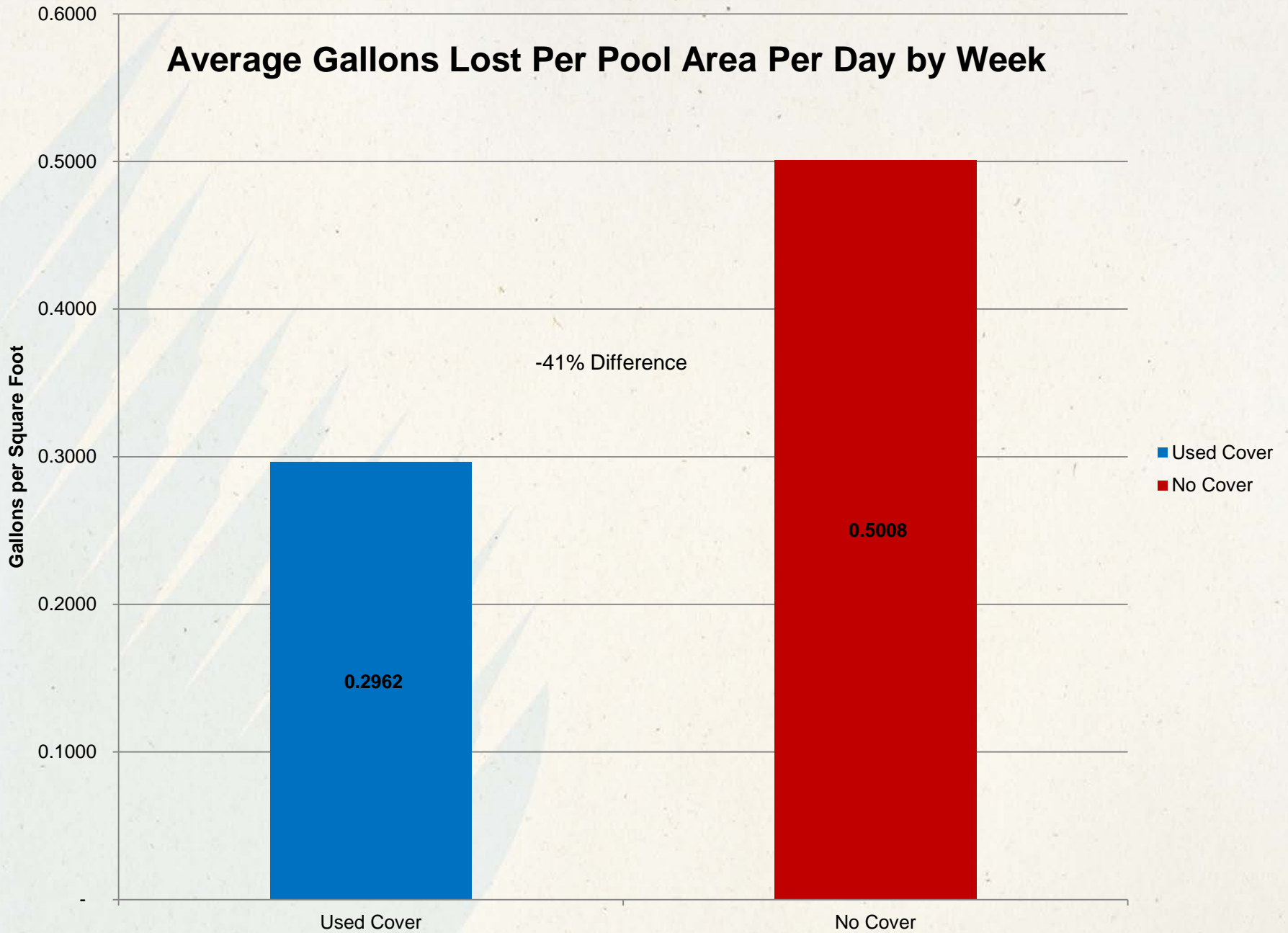
Average Gallons Lost per Pool Area per Day by Week



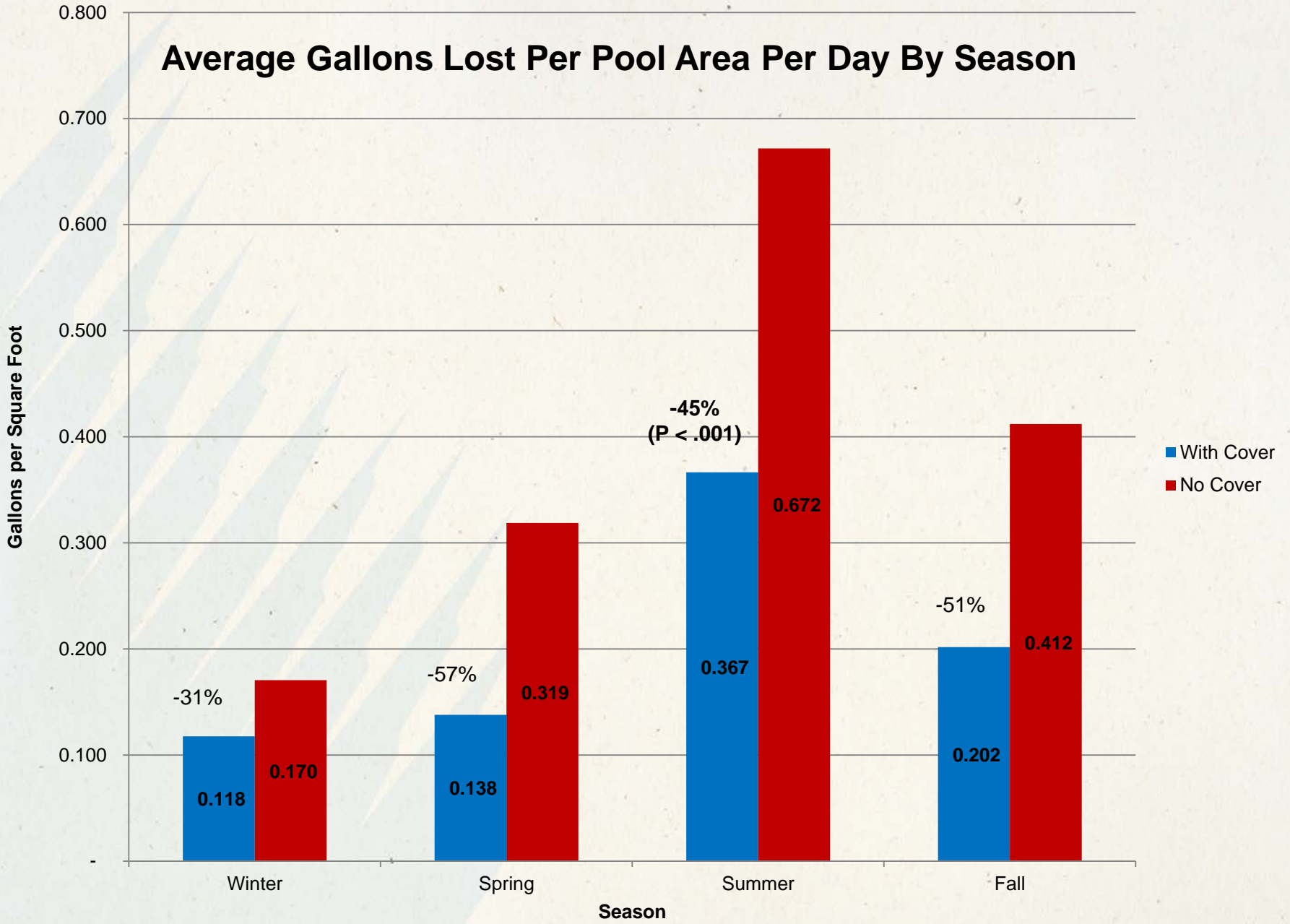
Average Gallons Lost Per Pool Area Per Day By Month



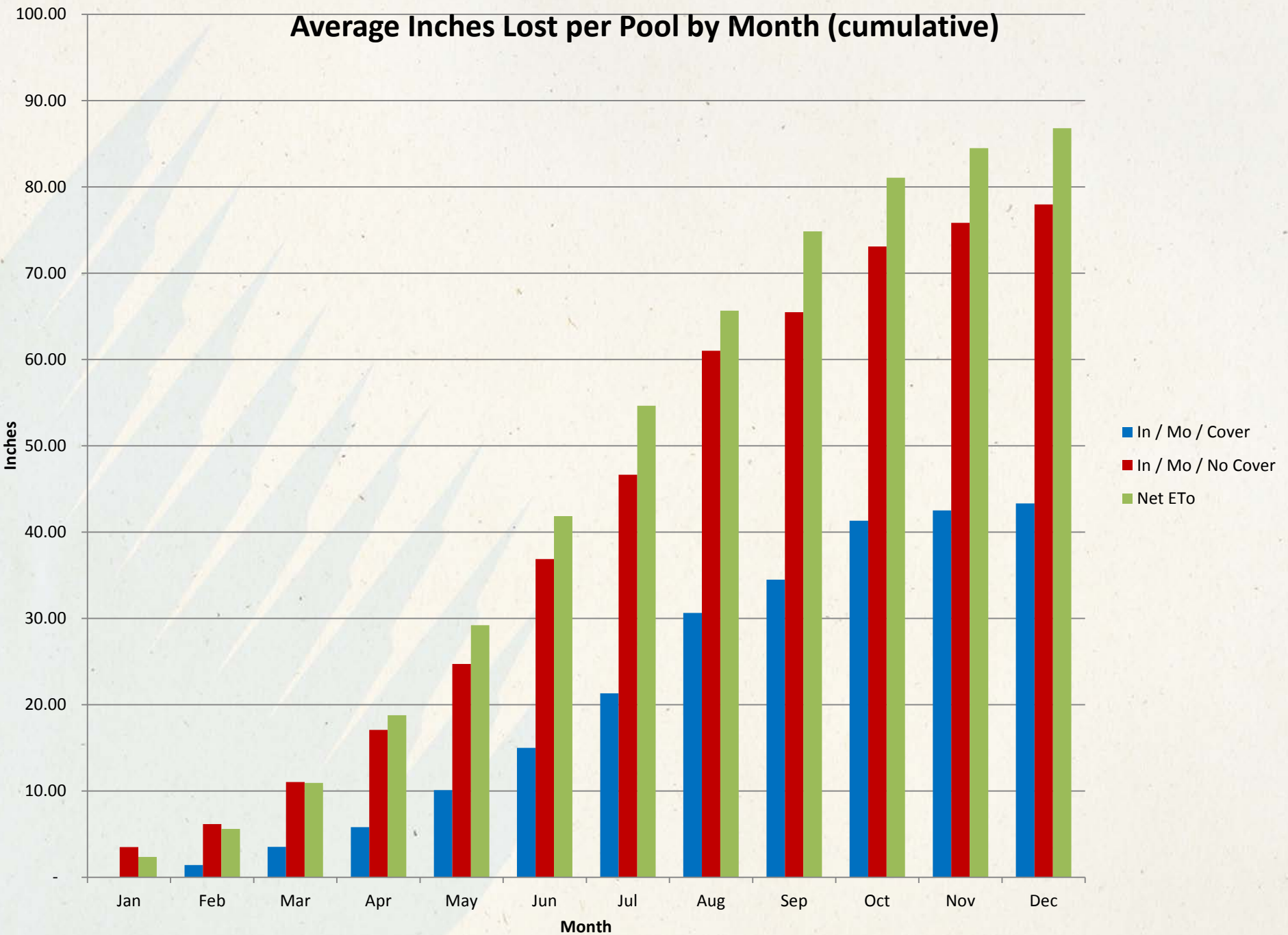
Average Gallons Lost Per Pool Area Per Day by Week



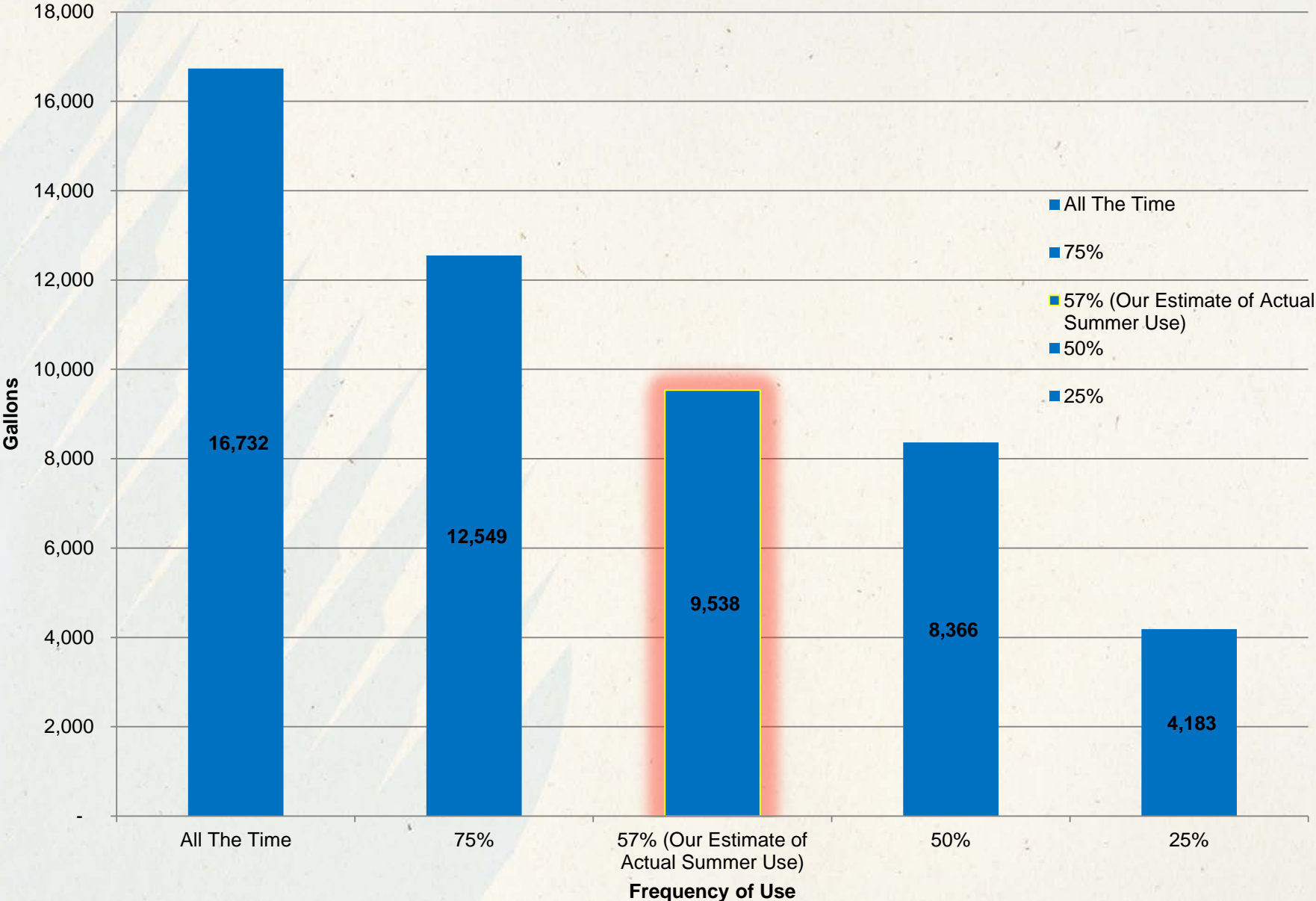
Average Gallons Lost Per Pool Area Per Day By Season



Average Inches Lost per Pool by Month (cumulative)



Annual Savings in Gallons with Pool Cover



Conclusions

- Evaporative losses track with seasons as expected
- Our original estimate of 12,700 gallons saved is higher than our revised estimated savings of 9,500 gallons per year
 - 25% lower than original model
- Our calculated evaporation rates differ slightly than what was observed
 - 77.96 inches per year on average versus 86.80 calculated

The End

Questions?