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EFFECTIVENESS OF RUNOFF-REDUCING WEATHER-BASED IRRIGATION CONTROLLERS (SMARTIMERS)

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Today's Presentation

- Introduction
 - Municipal Water District of Orange County Summary
 - California's Water Supply Issues
 - SmarTimer Definition
- Study Background
- Study Potable Water Consumption Savings
 - Approach
 - Results
 - Next steps
- Study Pollution Prevention, Reduction in Urban Runoff, and Improvement in Water Quality
 - Approach
 - Results
- Conclusions



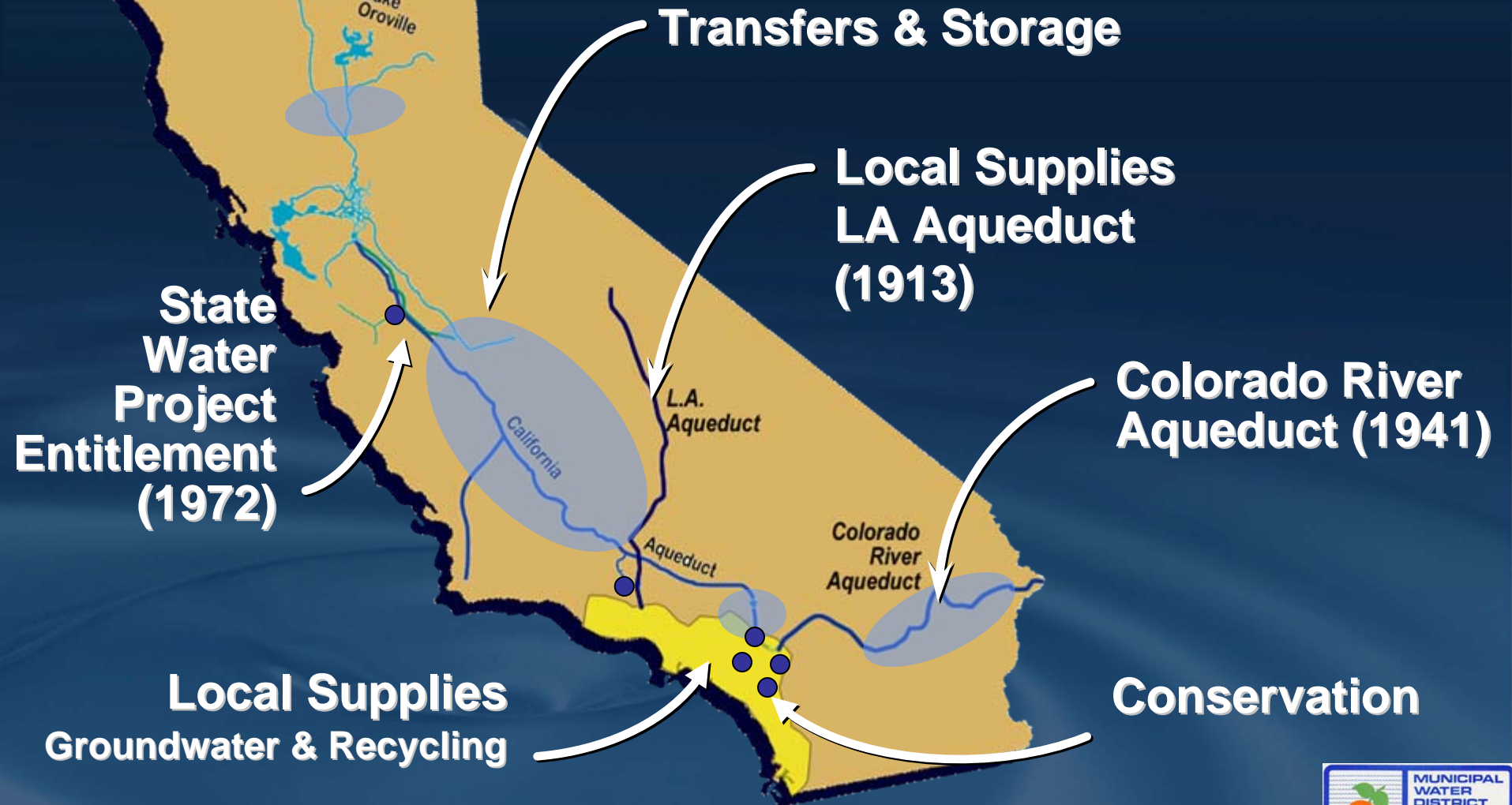
Municipal Water District of Orange County

- Water wholesaler and resource planning agency
 - Ensure a reliable supply of imported water
 - 30 cities, retail water agencies in Orange County
- Governed by seven-member elected board of directors
- Service area: 600 square miles
- Service area population: 2.2 million





Where Southern California Gets its Water





Water Supply Issues

- State Water Project
 - 30% reduction due to:
 - Endangered Delta Smelt
 - Regional drought
- Colorado River Aqueduct
 - 30% reduction due to:
 - Regional drought
 - Allotment reduced
- *Quagga* Mussels



Water Use Efficiency Programs We Offer

- Residential Water Saving Devices Rebate Programs
 - (Indoor/Outdoor)
- Commercial, Institutional, and Industrial (CII) Water Saving Devices Rebate Programs
 - (Indoor/Outdoor)
 - Public Sector Program
- Hotel Survey Programs
- Landscape Education Programs
- Landscape Irrigation Budgets and Performance Reporting
- School Outreach Programs
- OC Water Hero



Definition of a Weather-Based Irrigation Controller (SmarTimer)¹

- Estimates or measures depletion of available plant soil moisture
- Replenishes water as needed while minimizing excess water use
- Properly cycles throughout the irrigation season with minimal human intervention

¹ Irrigation Association



Two Types of SmarTimers

- Historic weather data with on-site weather station, uses local solar radiation or air temperature correlation
 - Should be programmed when installed and then periodically adjusted
 - No monthly charge
- Historic weather data from wireless updates using California Irrigation Management Information System (CIMIS) or equivalent
 - Are able to handle dynamic site conditions
 - May have monthly charge
- Real-time weather data from internet-based system
 - Are able to handle dynamic site conditions
 - May have an annual service charge

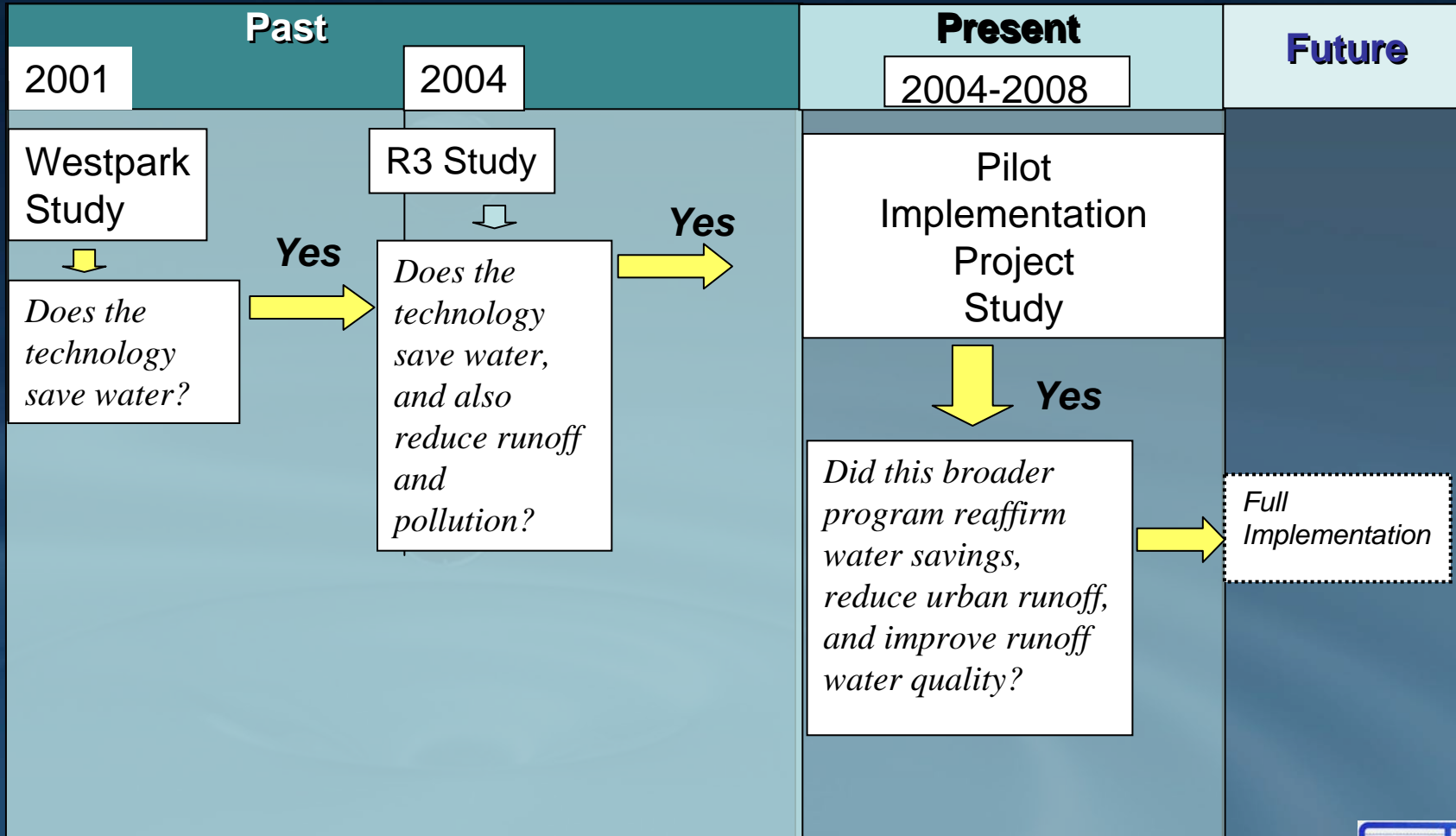


Study Introduction

- As of July 2008, approximately 4,100 SmarTimers were installed in residential and commercial settings throughout Orange County.
- Time frame: 2004-2006
- Objectives
 - Determine effectiveness of SmarTimers
 - Across brands
 - Overall – Residential and Commercial
 - Reduce outdoor water use
 - Maintain healthy and attractive landscaping
 - Reduce runoff and improve water quality



MWDOC SmarTimer Program History





Project Background

- 2004-2006
- To promote technology, rebates, and water savings combined with runoff reduction and water quality improvement
- Direct, targeted marketing
- Rebate-based participation
- 3 different ET zones
 - Coastal
 - Central
 - Foothill
- 8 brands
- Homeowner or professionally installed



Methodology

- Compare average pre- and post-installation water meter data
 - Installations prior to April 2006
 - Focused on 12 months of post-installation data
 - Assumed no changes in indoor and/or outdoor potable water use
 - All changes due to SmarTimer installation
- Calculated average calendar monthly usage
- Calculated average annual pre- and post-retrofit usage data
- Statistically compared the two periods



Methodology

- Inspection and Survey Processes
 - Troubleshoot product problems (both SmarTimers and in-ground irrigation equipment)
 - Prevent fraud
 - Mission Resources Conservation District staff utilized to conduct inspections for 100% of program participants
 - Customized recommendations for irrigation system improvements and problems denoted with a flag



Results

- **Please Note:**
 - The data for this study were not normalized for weather with advanced statistical modeling
 - The results obtained from the retrofit participants in this study were not compared to a control set of similar participants



Results

- Single Family Residential Installation
 - Savings of 18.3 gpd for 899 water accounts
 - 439 water accounts (49%) not significantly different
 - 460 water accounts (51%) had significant different water usage – 294 saved, 166 used more
 - Net average savings of 35.7 gpd for SFR participants

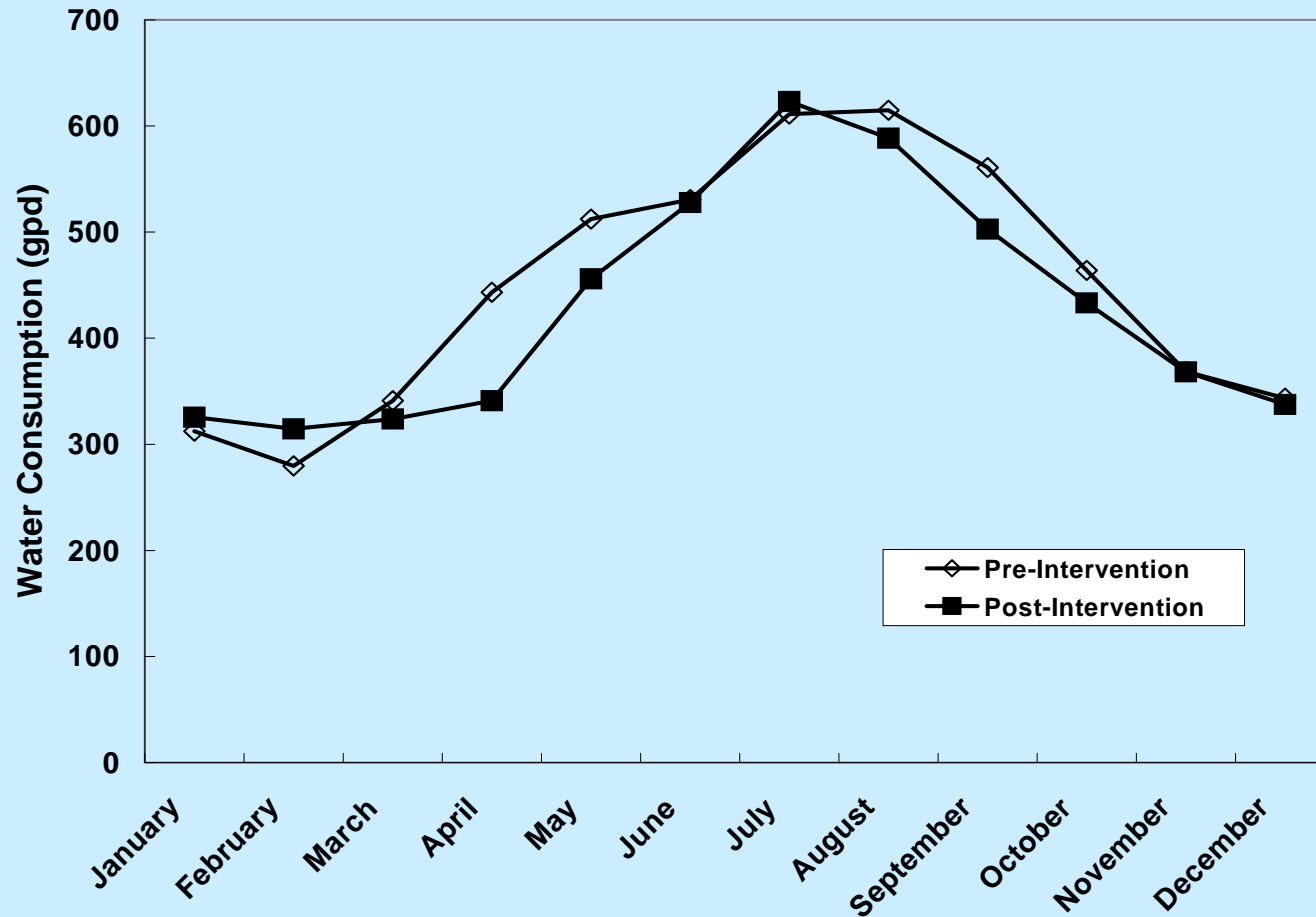


Commercial Accounts

- Savings of 190 gpd for 323 accounts
 - 189 accounts (59%) not significantly different
 - 134 accounts (41%) had significantly different water usage – 98 saved, 36 used more
 - Net average savings was 460 gpd



SFR Water Savings by Month





SmarTimers with Statistically Non-Significant Water Savings

- Further study needed
- Accurate weather data needed for normalization of water consumption data analyses
- Potential Hypotheses
 - Some do not work as well
 - Need periodic re-adjustment
 - Disproportionate installation in low ET zone
 - Untimely repairs of valves/sprinkler heads
 - Default settings pre-programmed into SmarTimers can be too lenient
 - Non-random population – more proactive early adopters do a better job overall
 - Other conservation program components getting traction

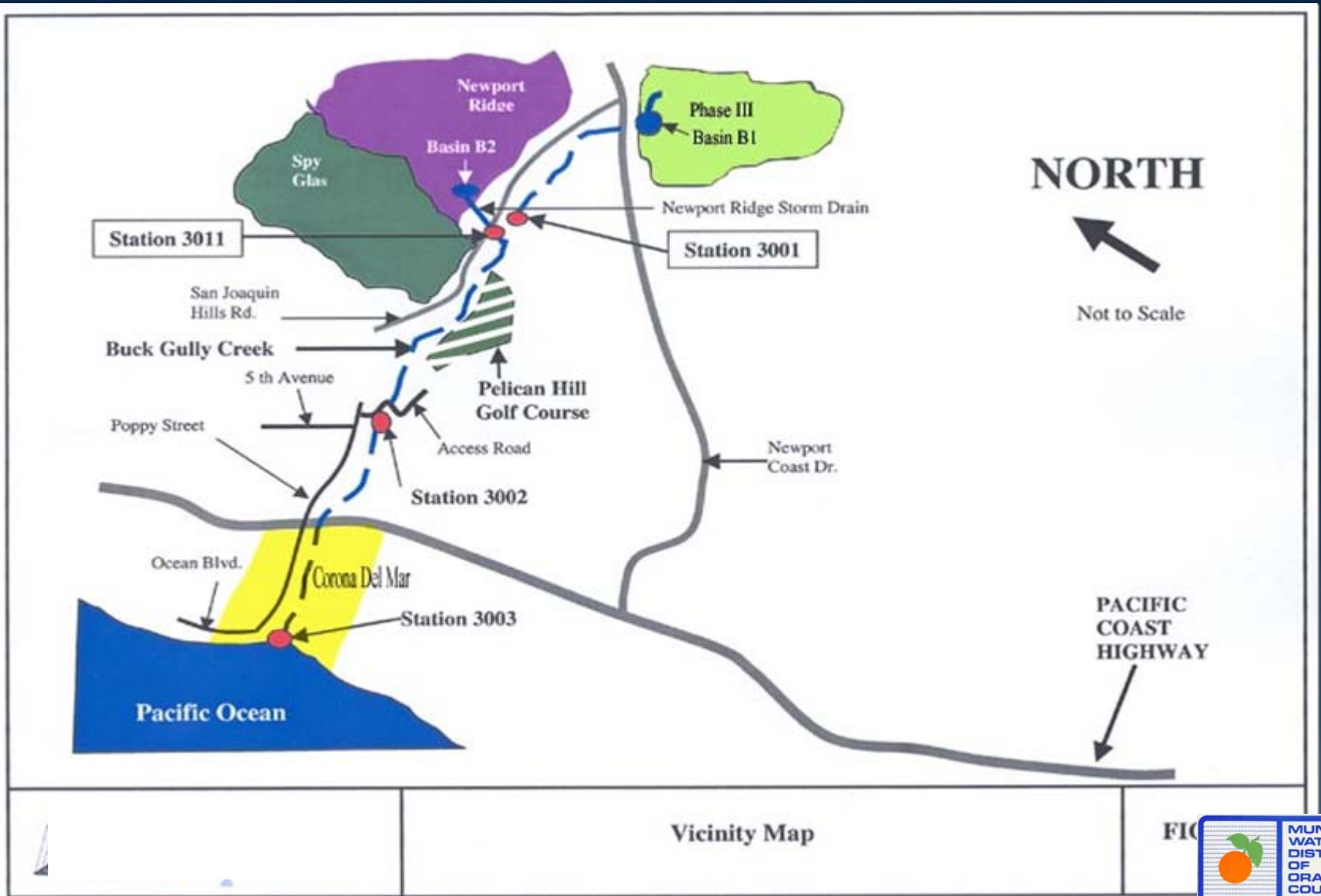


Urban Runoff Flow and Water Quality

- Background
 - Buck Gully – coastal canyon in Newport Beach, Calif.
 - Drains to Area of Special Biological Significance
 - Primary source of non-point source pollution is runoff due to over-irrigation
- Commercial retrofit (3011) versus control (3001)
 - Similar configurations (lot size, slope, and turf-to-shrub ratio) thus runoff conditions are comparable
 - Irvine Ranch Water District separately metered irrigation water for landscape



Project Location





Monitoring Stations

Outside view of 3001 Control Area



**Inside close-up view of 3001 Retrofit Area
showing detail of weir's construction**



Buck Gully- From the Ocean





Runoff in Buck Gully



Runoff reaching storm drain



Buck Gully

Little Corona Beach where runoff collects before entering tide pools below.



This beach sand erosion is caused by runoff, not tidal movement.



Evidence of wide fluctuations in runoff water levels, not due to tidal changes.





Methods

- Post-installation monitoring – Dry-Season 2006
 - Weekly grab samples
 - Continuous flow monitoring – American Sigma 950 flow meters (Hach)
- Data analysis and evaluation
 - Runoff reduction
 - Water quality



Methods

- Installed 55 commercial wireless SmarTimers in retrofit area
- Winter 2005/2006





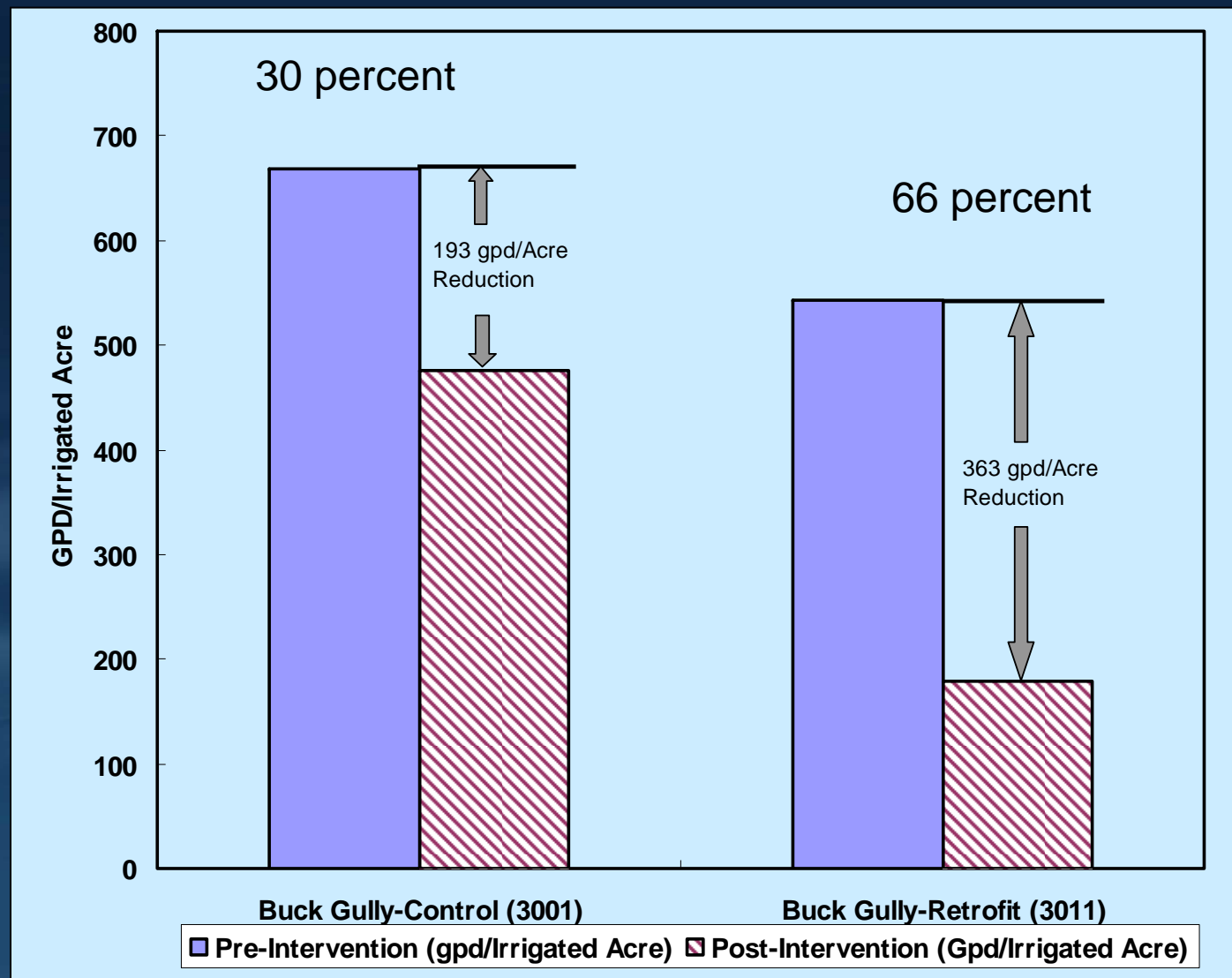
Monitored Parameters

Dry-Season Monitoring (April – October)

Baseline	Collection	Year
Flow	Recorded every minute	2003 and 2004
Nutrient Concentrations	NO ₂ -N, NO ₃ -N, NH ₃ -N, T-P, TKN, O-PO ₄ -P	2004
Post-Installation		
Nutrient Concentrations	NO ₂ -N, NO ₃ -N, NH ₃ -N, T-P, TKN, O-PO ₄ -P	2006
Flow	Recorded every minute	2006

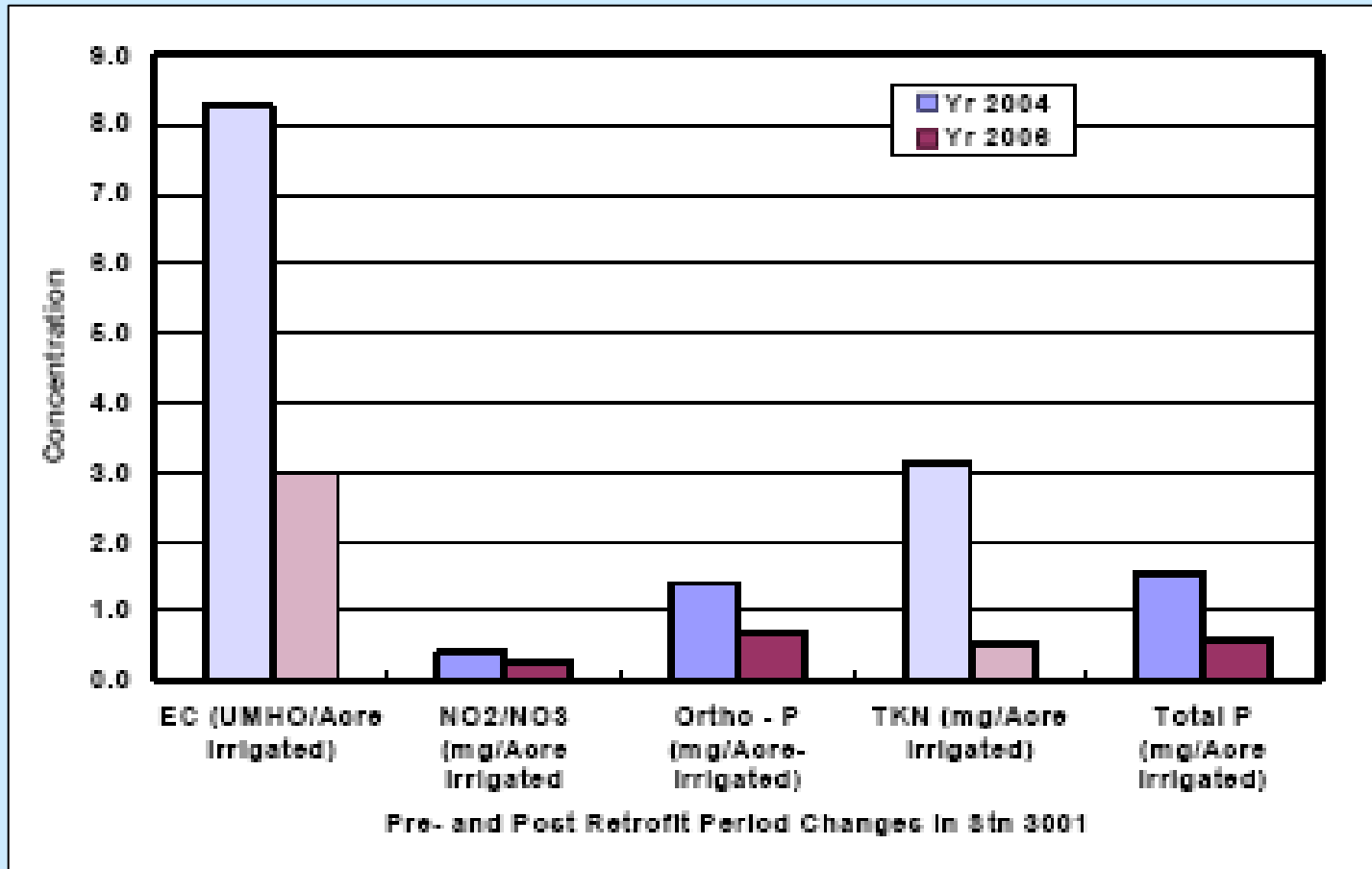


Results – Runoff Reduction



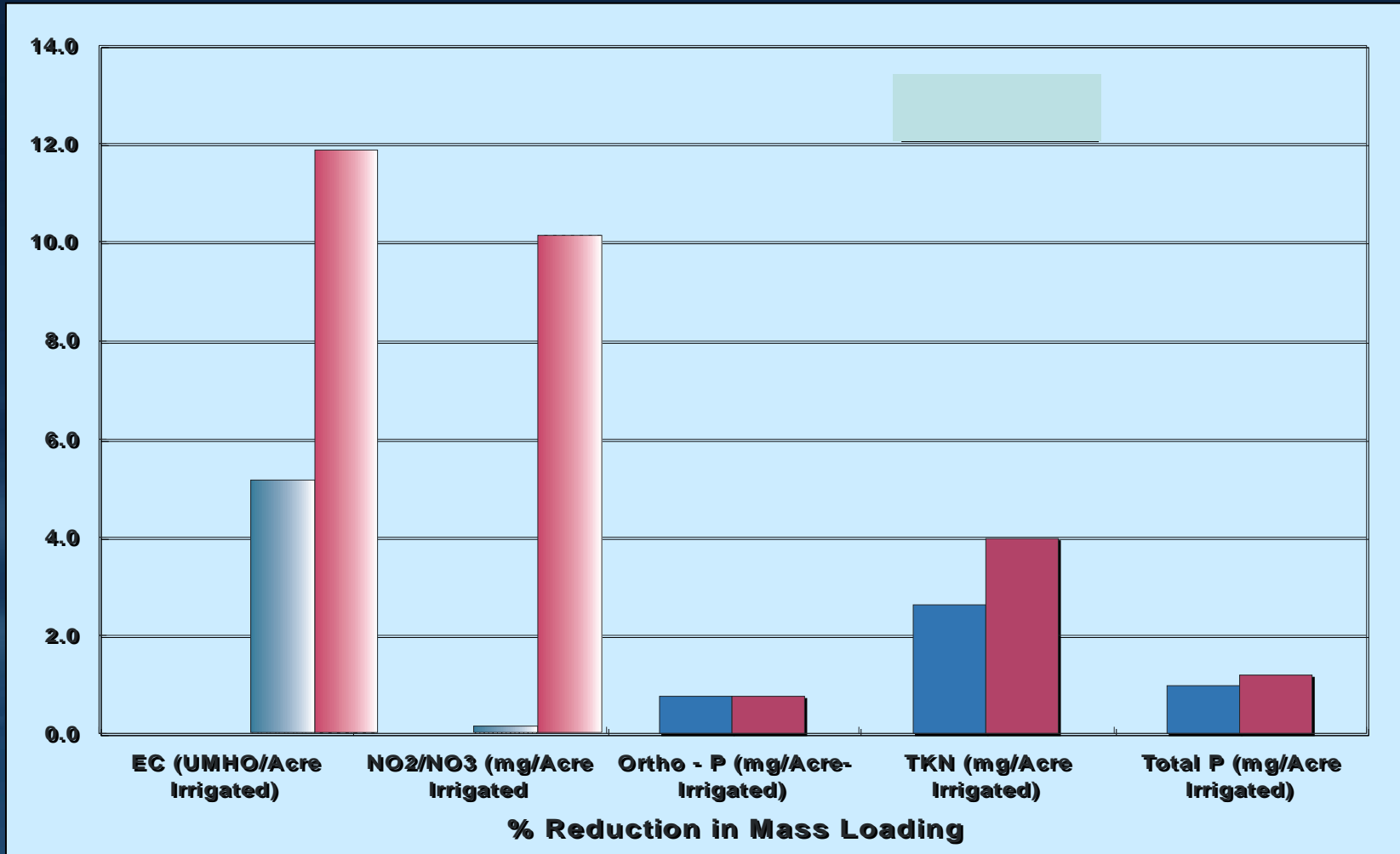


Nutrient Loading Results





Reduction in Mass Loading



NO₂/NO₃ and EC for study area (3011) significantly decreased versus control (3001).
Higher bar indicates more reduction in flux.



Runoff and Water Quality Summary

- 2X runoff reduction
- Water savings of 170 gpd/irrigated acre
- Higher concentrations but lower total mass loading in retrofit area of:
 - EC
 - NO_3/NO_2
 - TKN



Questions ?

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