

Multiplier Effect Study for Turf Removal – 2016 Update

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CA-NV AWWA Spring 2017 Conference
April 11, 2017



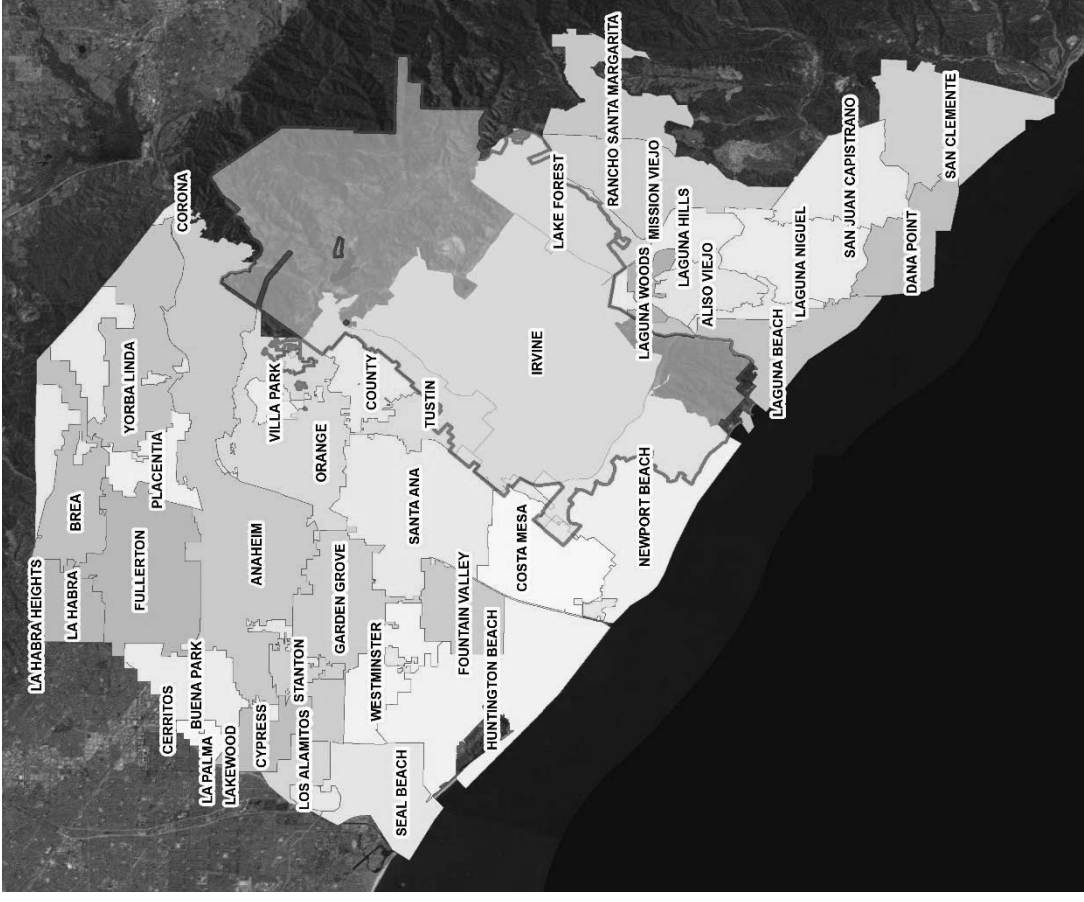
Overview

- Introduction
- Turf Removal Program
- Multiplier Effect Study
 - Study design and objectives
 - Data collection with ArcGIS Collector, Online
 - Data analysis with ArcGIS Desktop
- 2015 Study Results
 - Multiplier, Saturation, & Effect Size
- 2016 Update Results
- Next Steps



About IRWD

- Formed in 1961
- 181 square miles (20% of Orange County)
- 390,000 residents & growing
- Over 110,000 accounts
- 64 villages with master planned communities
- Supply potable, recycled, and non-potable water



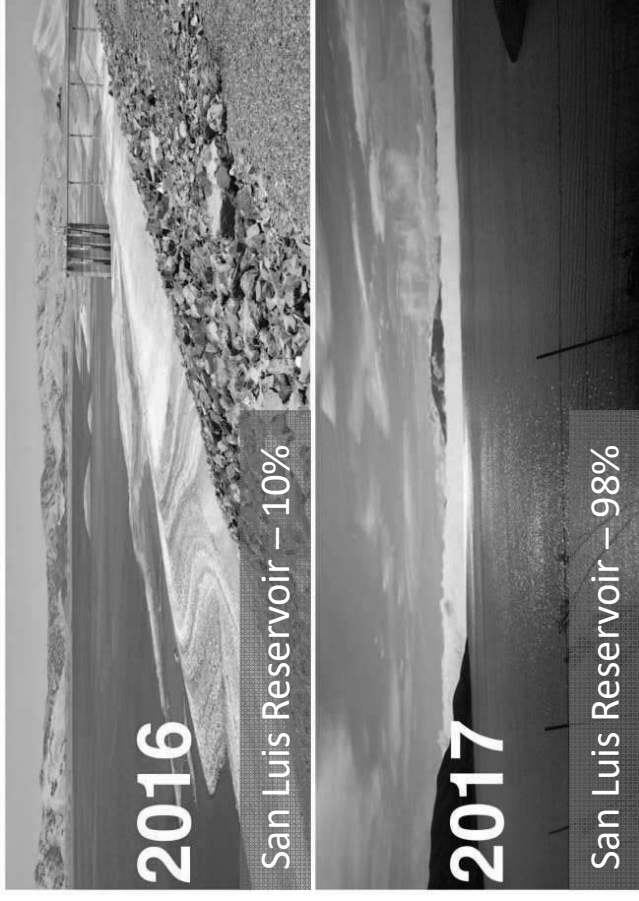
About DCSE

- Partnered with IRWD to complete the study
- Over 25 years of water resources decision support systems development in:
 - GIS mapping and GPS survey
 - Water resources
 - Water budgets
 - Modeling and master plans
 - IT & database management



Historic Drought

- Recent 4 year drought
- Multiple record-breaking dry years and storage lows
- CA drought emergency – January 2014
- Unprecedented incentive funding
- 25% statewide mandatory reduction



IRWD Drought Response

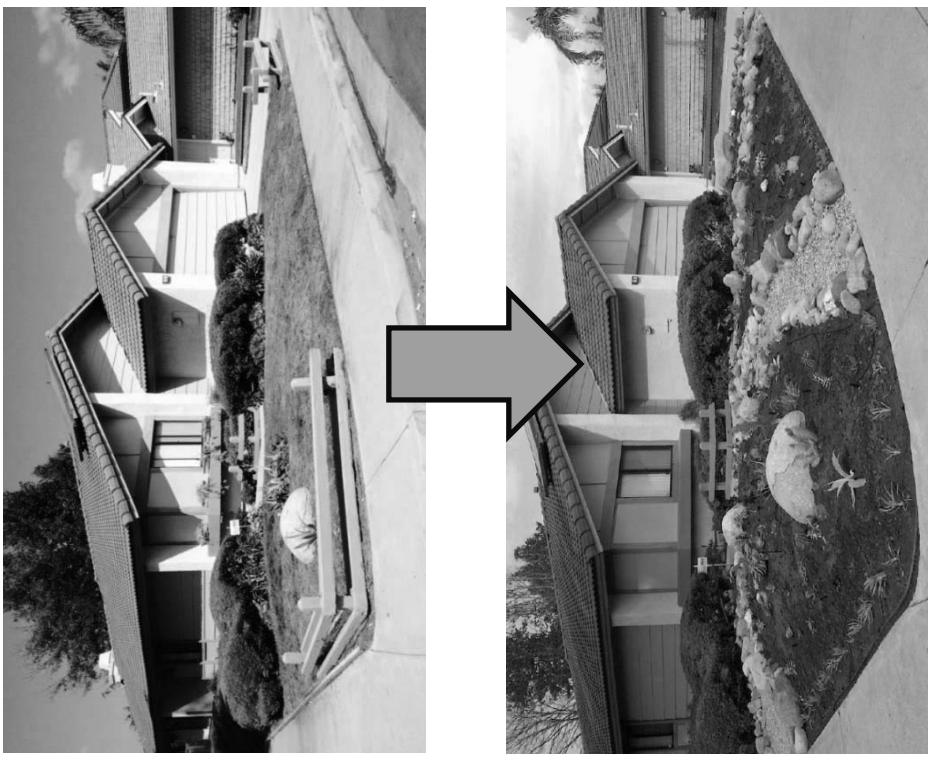
- Focus on outdoor savings
- 16% reduction target from SWRCB
- New outdoor water budget formula
- RightScape campaign and workshop series
- Turf removal program



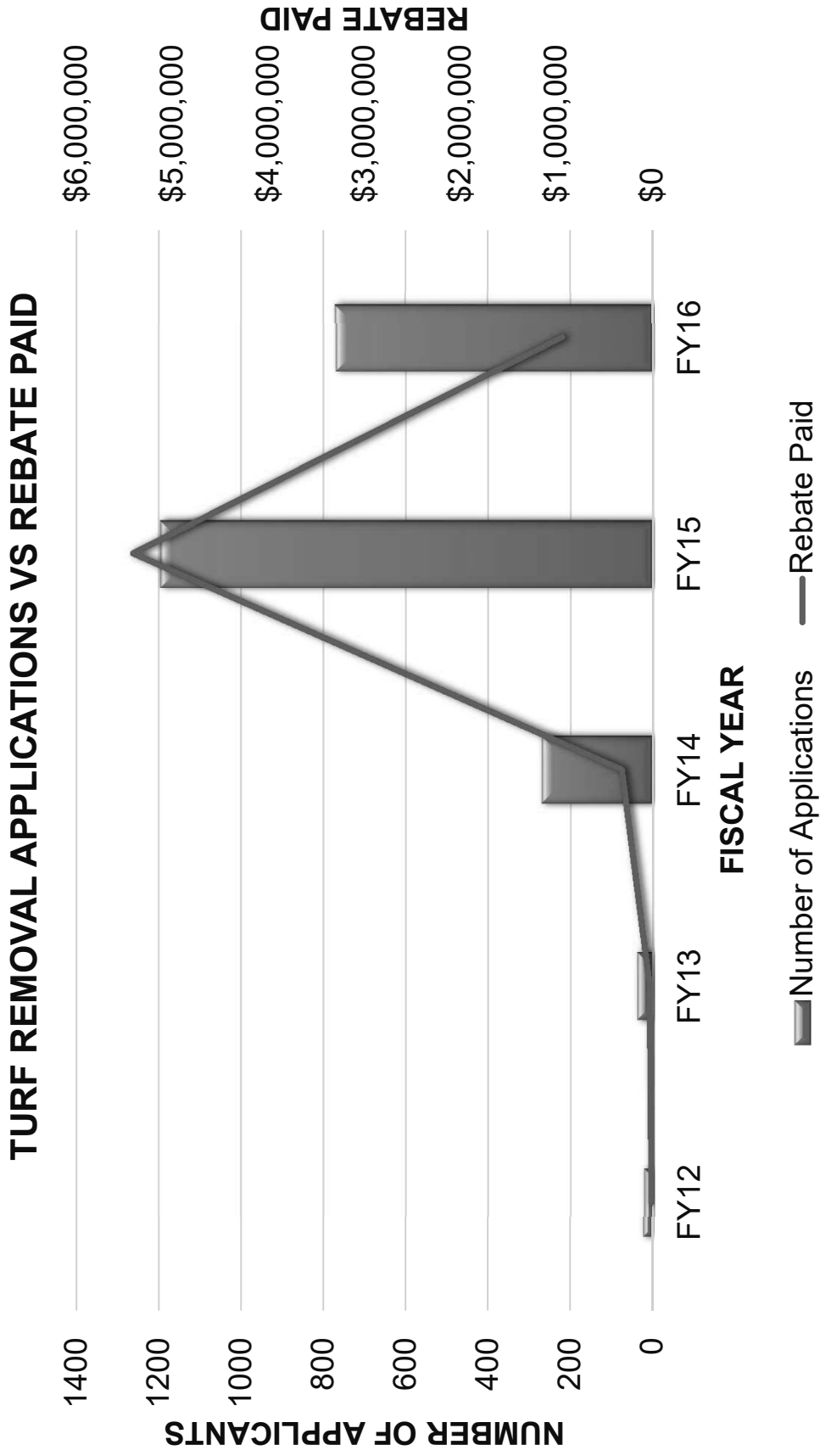
RightScape™

IRWD Turf Removal Program

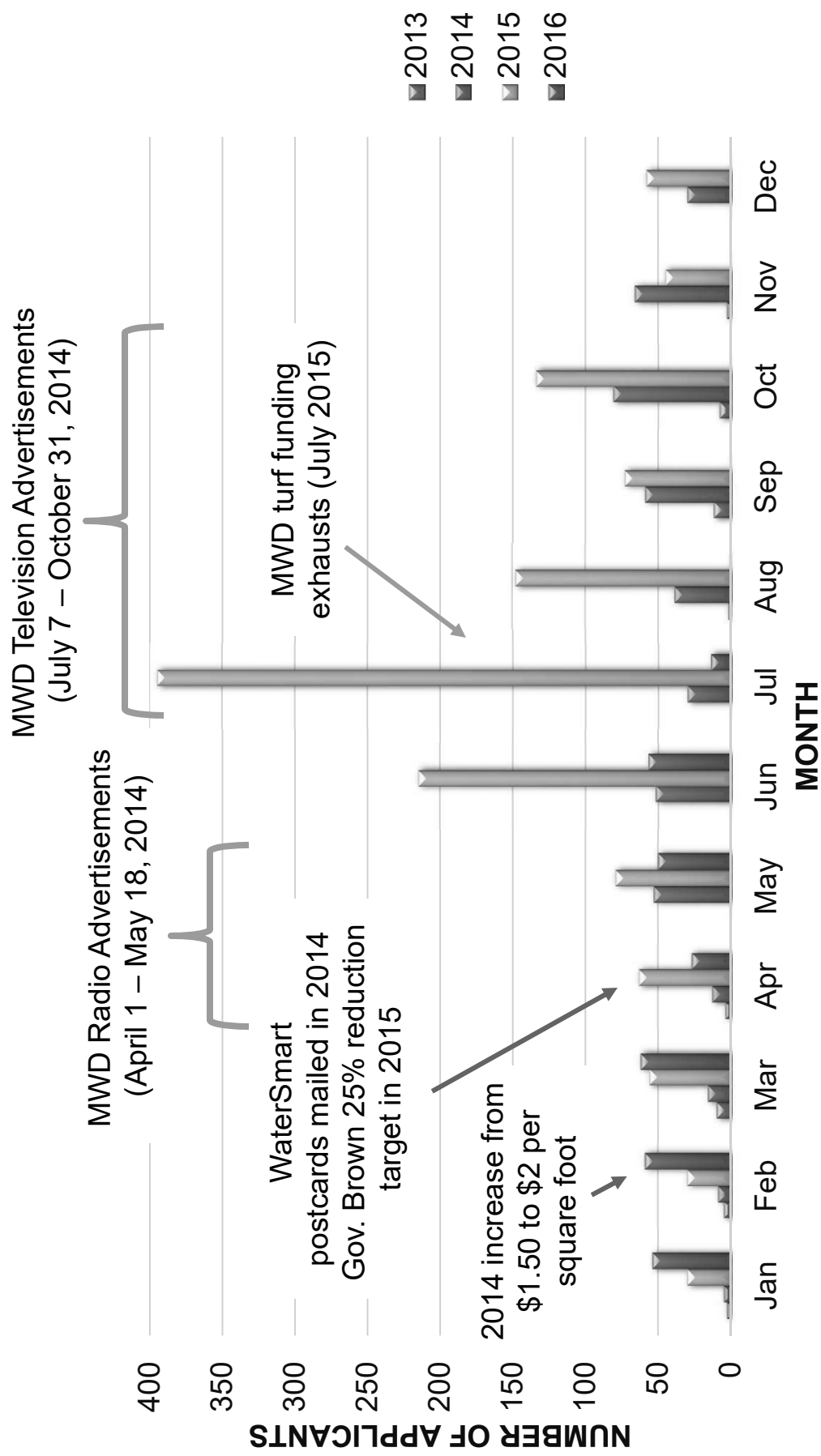
- Began in 2011
- Minimum of 250 sq.ft., no maximum
- Irrigation conversion required
- Pre and post inspections by IRWD
- \$2/sqft residential, \$1/sqft CII
- Leverage other rebates and partnerships
- Over 1500 applicants



Program Participation

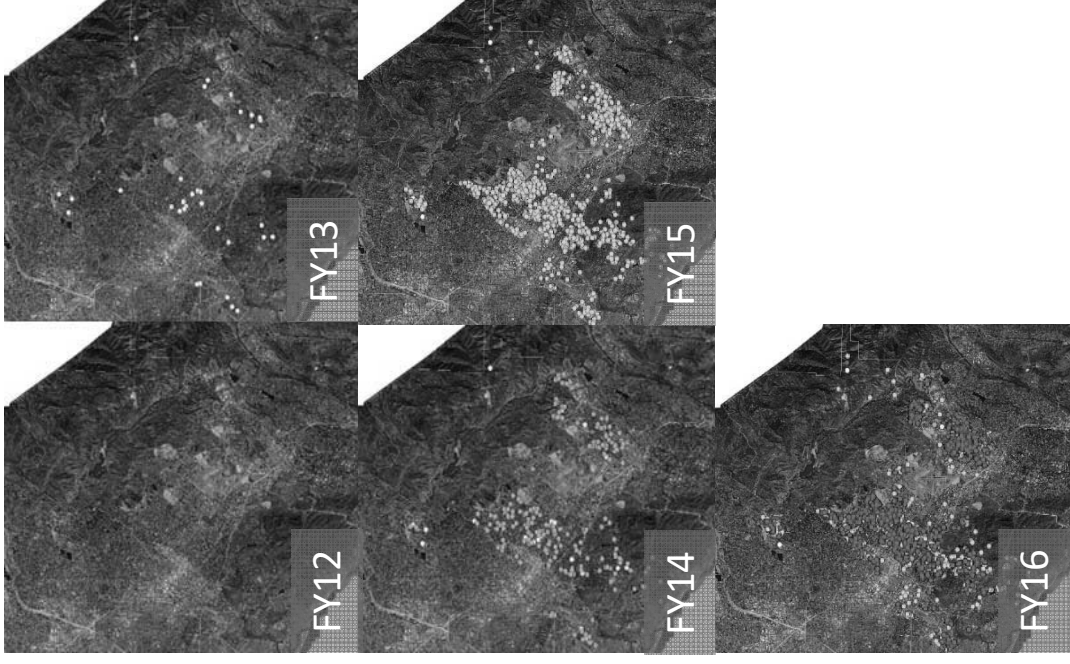


Program Participation & Outreach, 2013-2016



Turf Removal - Major Questions

- Diffusion rate associated with turf removal program?
- Does the diffusion rate change as the result of certain conditions or variables?
- How does the multiplier effect impact the cost-effectiveness of the program?
- Do certain landscape types tend to cluster or proliferate faster?
- What are some of the social and behavioral dynamics affecting market transformation?

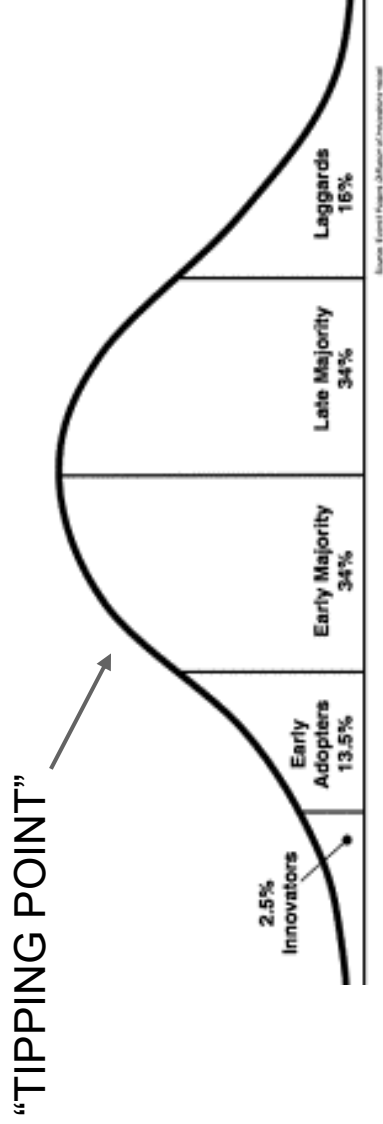
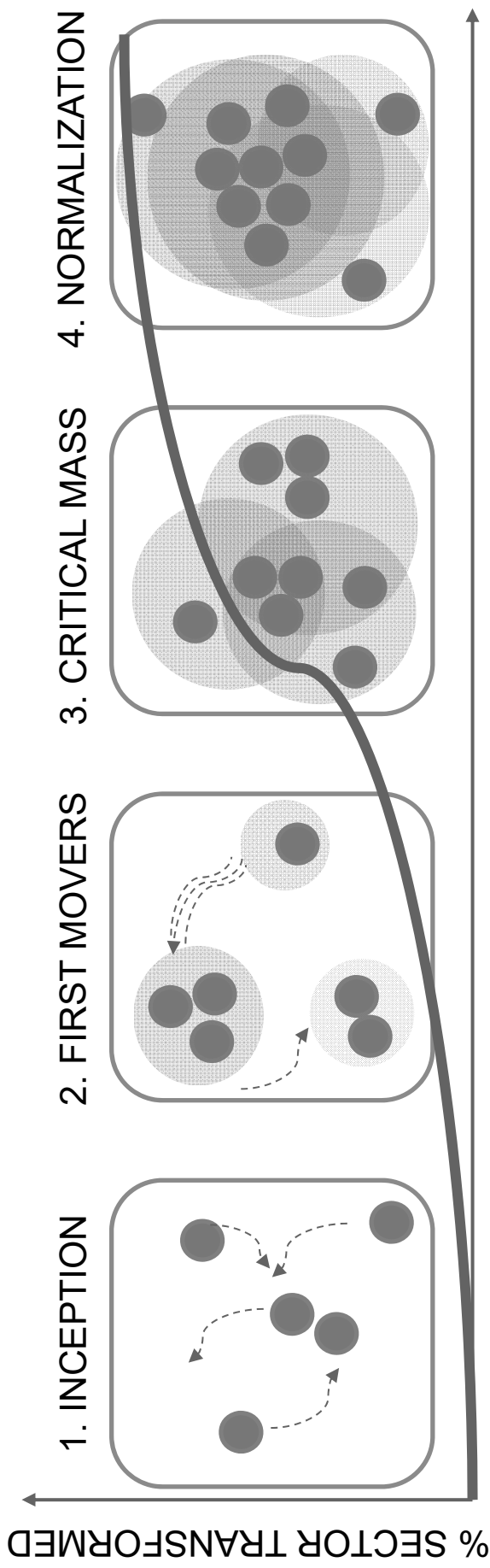


Symbols, Norms, & Institutions

- Qualities of the front yard
 - Inherently public
 - External display of internalized societal expectations
 - Strong cultural symbol (i.e. 'lush green lawn')
- Norms and institutions
 - Descriptive and injunctive/moral norms
 - Actions influenced and reinforced by formal and informal institutions



Market Transformation

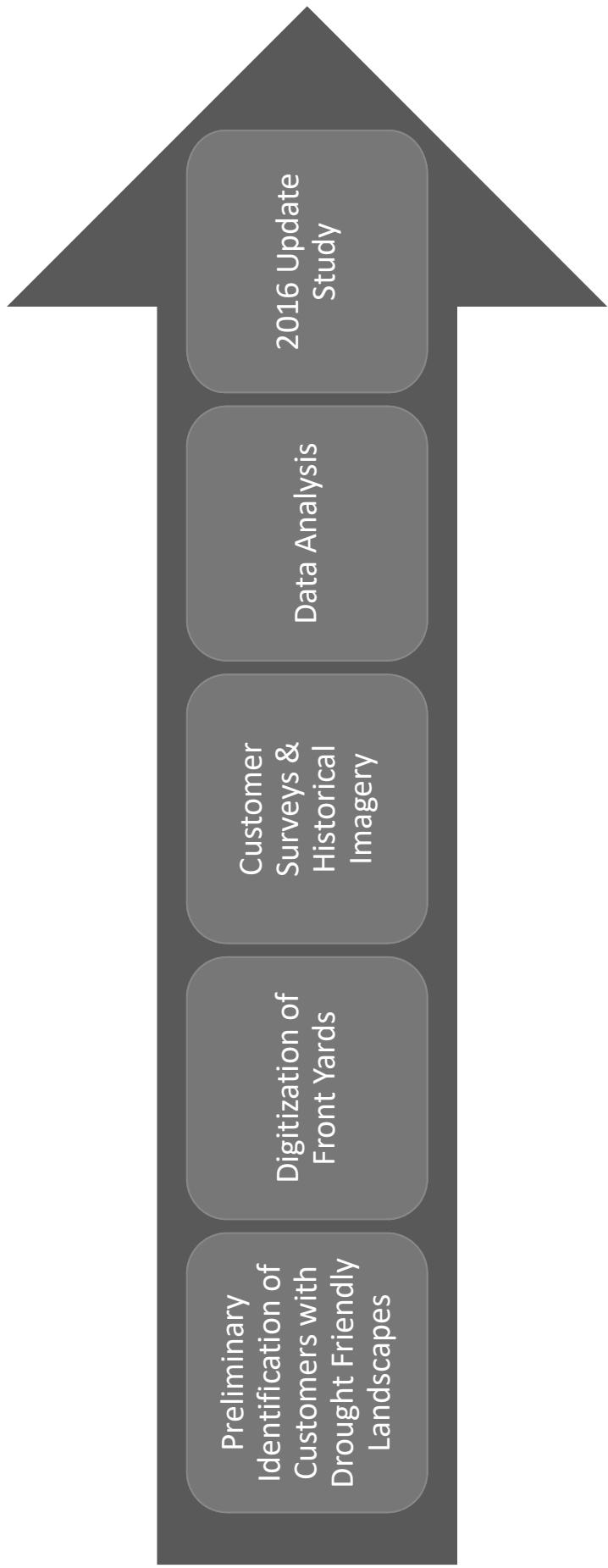


Study Design & Data Needs

- Sample neighborhoods
 - Considered age of home, home values, density of turf removal participants
 - 14 neighborhoods selected
 - 150-350 homes per neighborhood
- Drought tolerant landscapes
 - Identify rebate and non-rebate participants
 - Determine landscape type
 - GIS is tool of choice
- Installation dates
 - Rebate participants – program install date
 - Non-rebate participants – surveys and historical imagery



Data Collection & Analysis Timeline



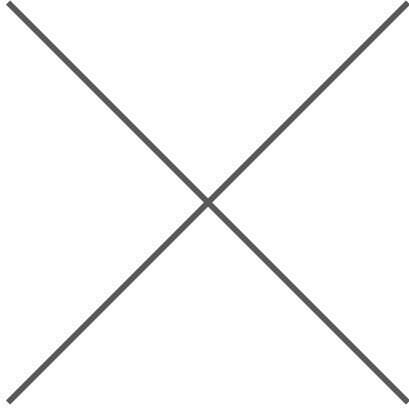
Landscape Archetypes



Brown Lawn



Artificial Turf



Desert/Southwest



Drought Tolerant

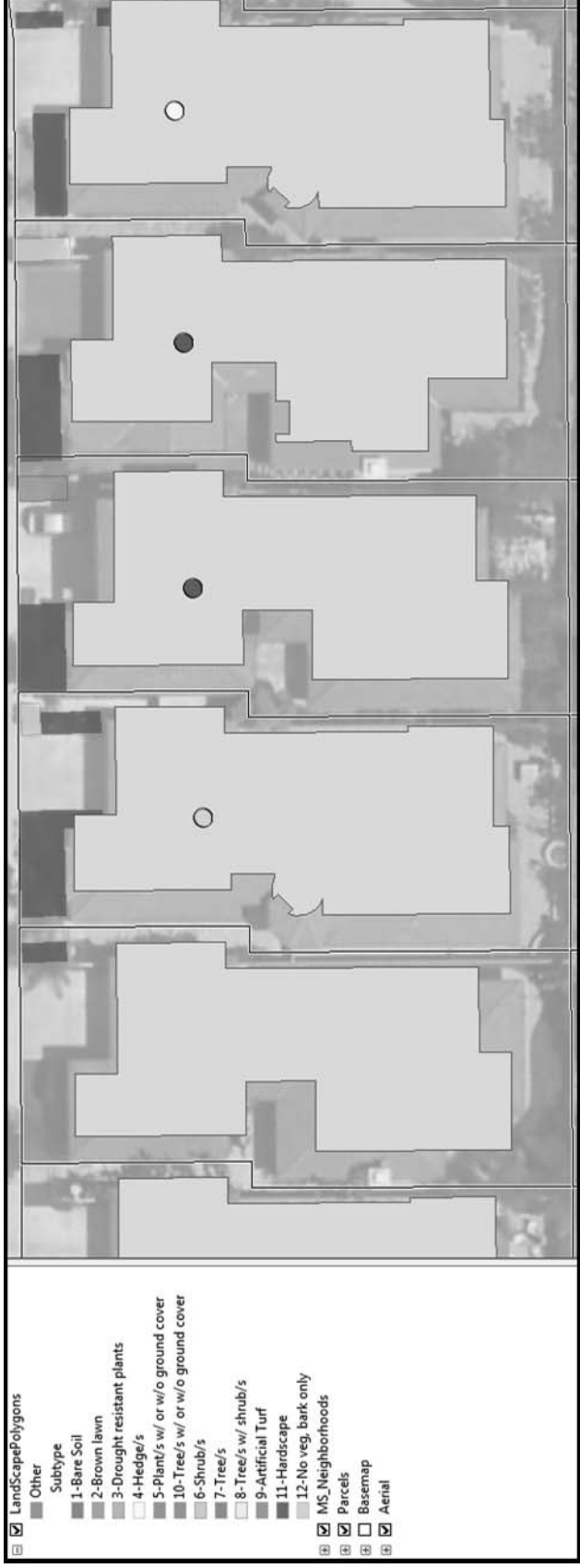
Preliminary Inspections – ArcGIS Collector

- ESRI Green Infrastructure Editing Template for ArcGIS Collector
- Preliminary field visits to identify customers without turf rebates with drought-tolerant landscapes
 - Classification of front yards without grass
 - Take photo in field and attach to data point
- Subsequent field visits for the 2016 update study also used the same template



Landscape Categorization

- Digitization of landscape areas by landscape category in ArcGIS



Data Collection – Customer Surveys

- Online Google Forms and paper surveys
- Phone surveys
- 466 customers targeted
- Response rate – 40%
- Raffle gift cards to incentivize responses

Water Efficient Landscape Study
IRVINE RANCH WATER DISTRICT - WATER USE EFFICIENCY DEPARTMENT

* Required

RightScape
Water Efficiency Made Easy

Please provide your name: *
Last Name, First Name

Your answer

Please provide your address: *
Address, City, State, Zip Code

Your answer

Please provide your email address:

Your answer

Which option best describes your front landscape? *

Medium to low water-use plants with rocks, mulch, dirt, or sand

Dry, golden or brown lawn

Other :

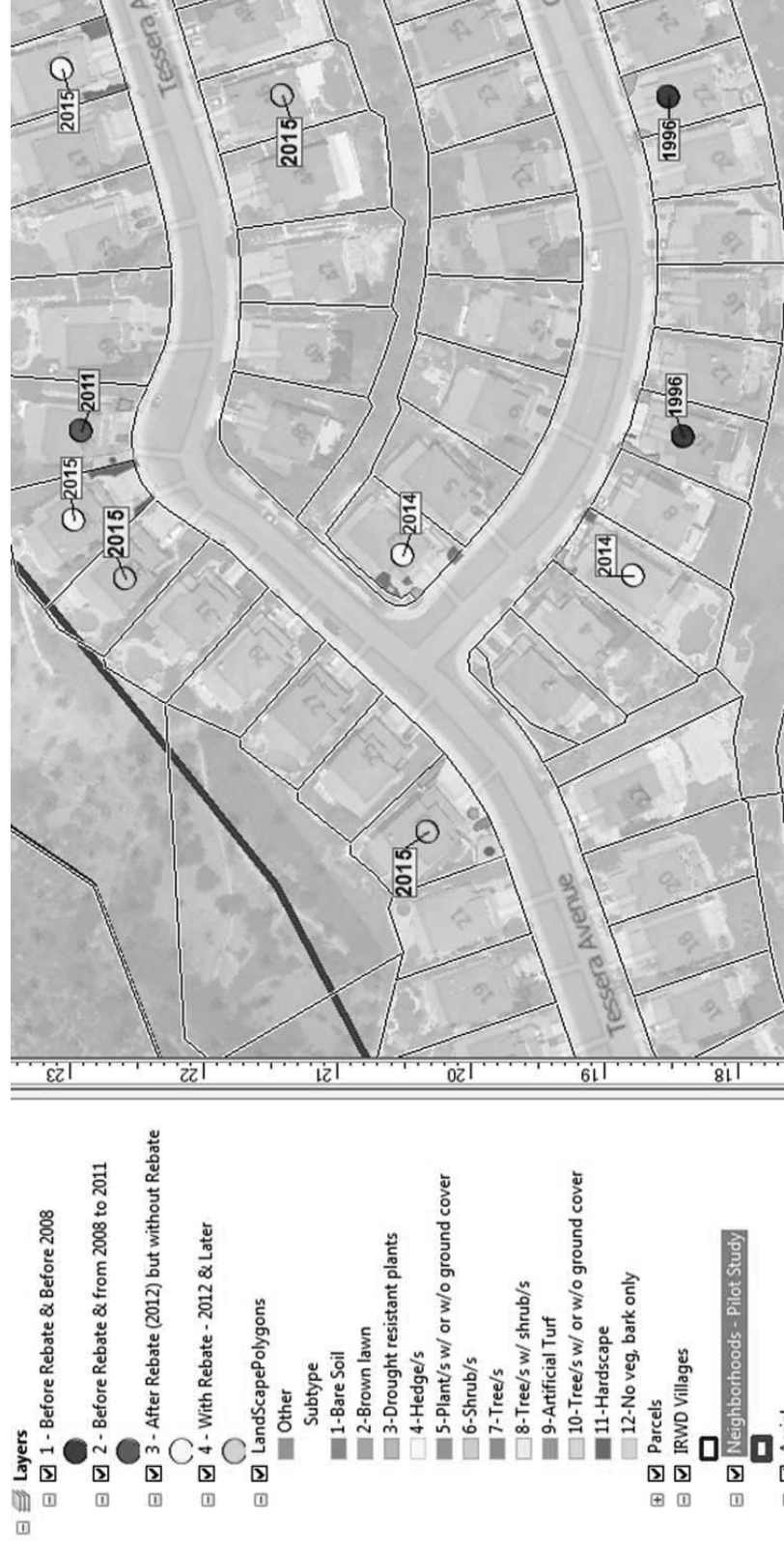
Data Collection – Historical Imagery

- Use of Google Street View to determine approximate year of landscape change (for customers who chose not to participate in survey)



Data Review

- Maps loaded into ArcGIS Desktop for review

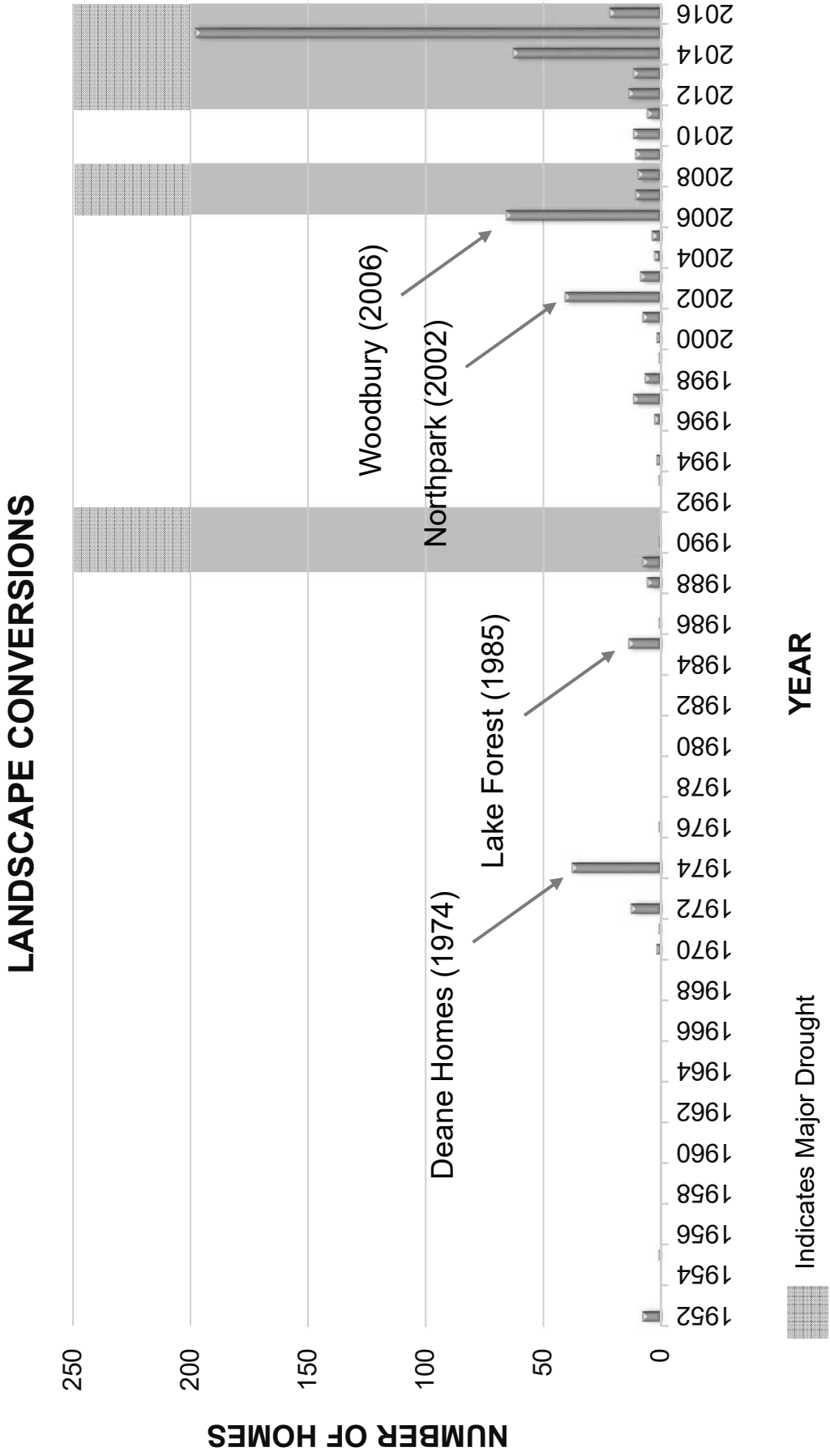


Challenges in 2015 Study

- Surveys were time intensive
- Access to customers
 - Yielded 40% response after considerable effort
- Accuracy
 - Self-reported data may not be correct
- Street-level historical imagery
 - Usually only available from 2009-current
- These challenges were overcome in the 2016 update by using 2015 data as a baseline



Timeline of Landscape Conversions

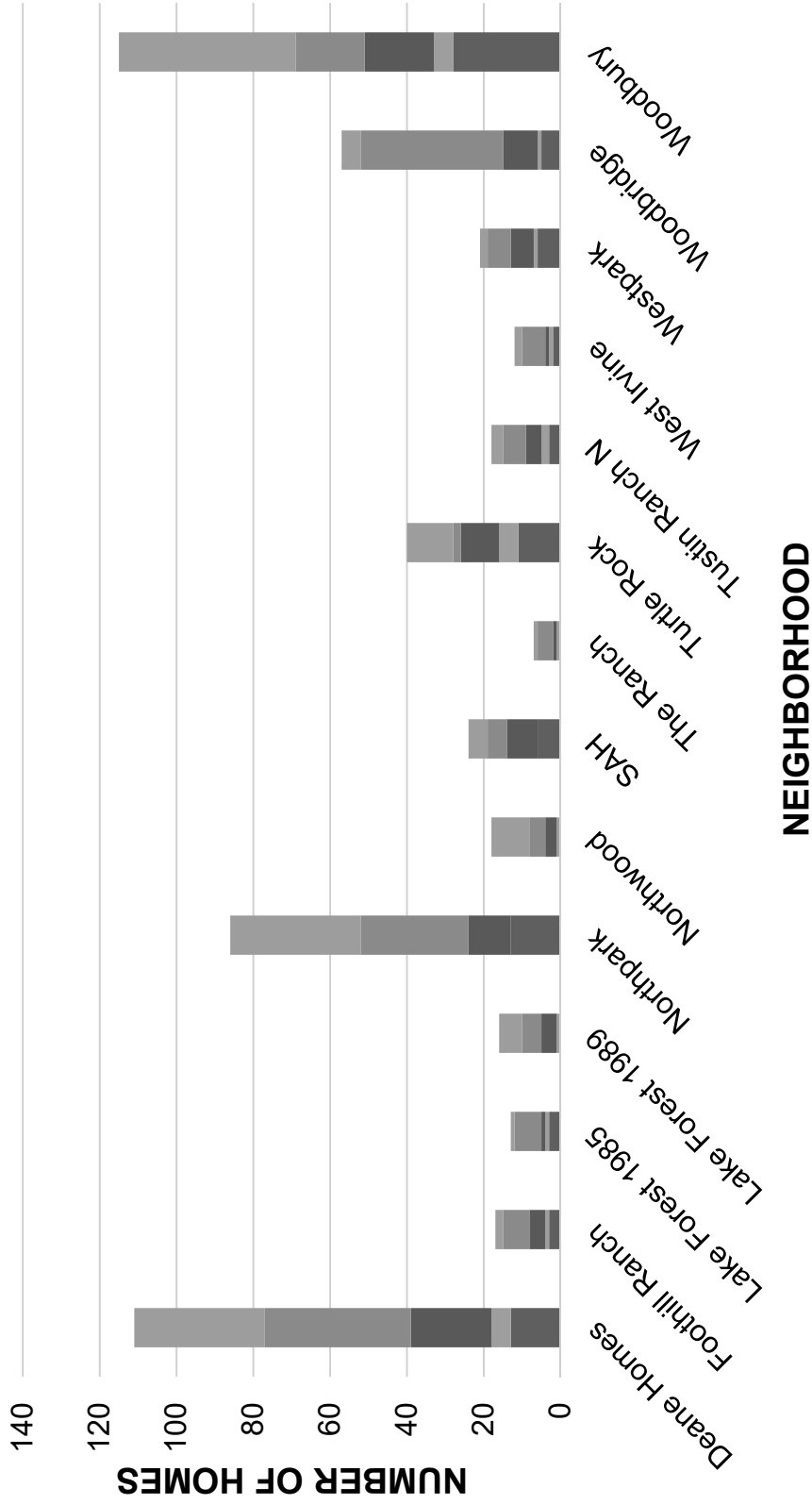


Data Categorization

Category	Start Year	End Year	Description
1	During Construction	2006	<ul style="list-style-type: none"> • No influence of recession; • limited drought impact; • no turf rebate
2	2007	2011	<ul style="list-style-type: none"> • Recession (2007-2012); • IRWD minimally impacted; • Drought (2007-2009); • no turf rebate
3	2012	2015	<ul style="list-style-type: none"> • Drought (2012-2016); • Non-rebate participants with drought-tolerant landscapes
4	2012	2015	<ul style="list-style-type: none"> • Drought (2012-2016); • Rebate participants with drought-tolerant landscapes
5	2015	2016	<ul style="list-style-type: none"> • Continued Drought • Non-rebate participants with drought-tolerant landscapes
6	2015	2016	<ul style="list-style-type: none"> • Continued Drought • Rebate participants with drought-tolerant landscapes

Temporal Distribution of Landscaping

TEMPORAL DISTRIBUTION OF DROUGHT-TOLERANT LANDSCAPES BY STUDY NEIGHBORHOOD



■ A - 2010 and Older ■ B - 2011 to 2013 ■ C - 2014 to 2015 ■ D - 2015 to 2016 ■ S - During Construction*

Effect Size – 2015 Study

% Conversion 2007-2011 (w/o Rebate)	% Conversion After 2012 (w/o Rebate)	Effect Size: Change (After-Before)
0.0249	0.1429	0.1180
0.0124	0.0503	0.0379
0.0131	0.0464	0.0333
0.0054	0.0601	0.0547
0.0197	0.0470	0.0272
0.0000	0.0417	0.0417
0.0193	0.1872	0.1679
0.0115	0.0465	0.0350
0.0421	0.1978	0.1557
0.0059	0.0355	0.0296
0.0000	0.0163	0.0163
0.0072	0.0870	0.0798
0.0060	0.0382	0.0322
0.0990	0.1209	0.0219
0.0173	0.0697	

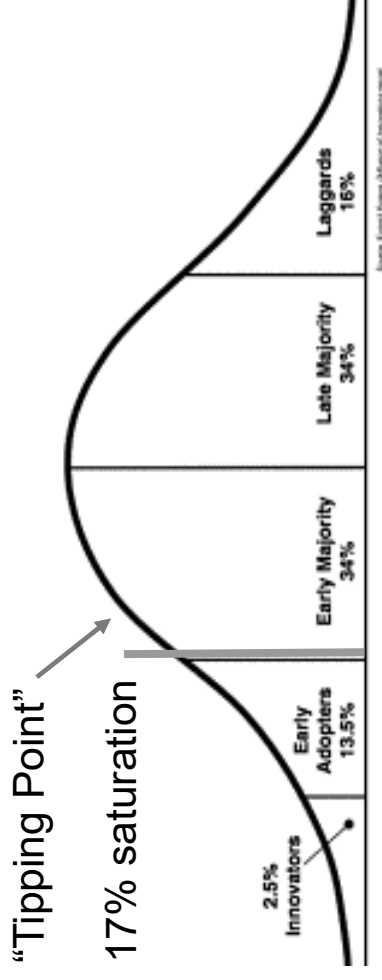
5 times more likely to convert w/o rebate after 2012 – likely due to introduction of turf program

Average Effect (Change)	0.0608
Standard Deviation	0.0503
Standard Error	0.0134
T-Statistic	4.5244
Level of Statistical Significance	0.0006

Statistically significant difference. Probability this is random is less than 0.0006

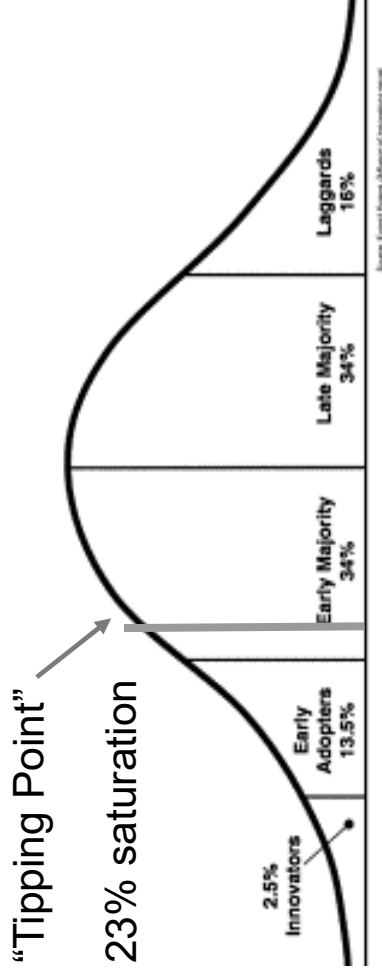
2015 Study Findings – Multiplier and Saturation

- Multiplier effect
 - 2012 through 2015 non-rebators and rebators
 - Multiplier of **1.14**
 - Every 7 rebate participants = approx. 8 non-rebate participants
- Saturation of study area
 - 17% conversion to drought tolerant landscapes



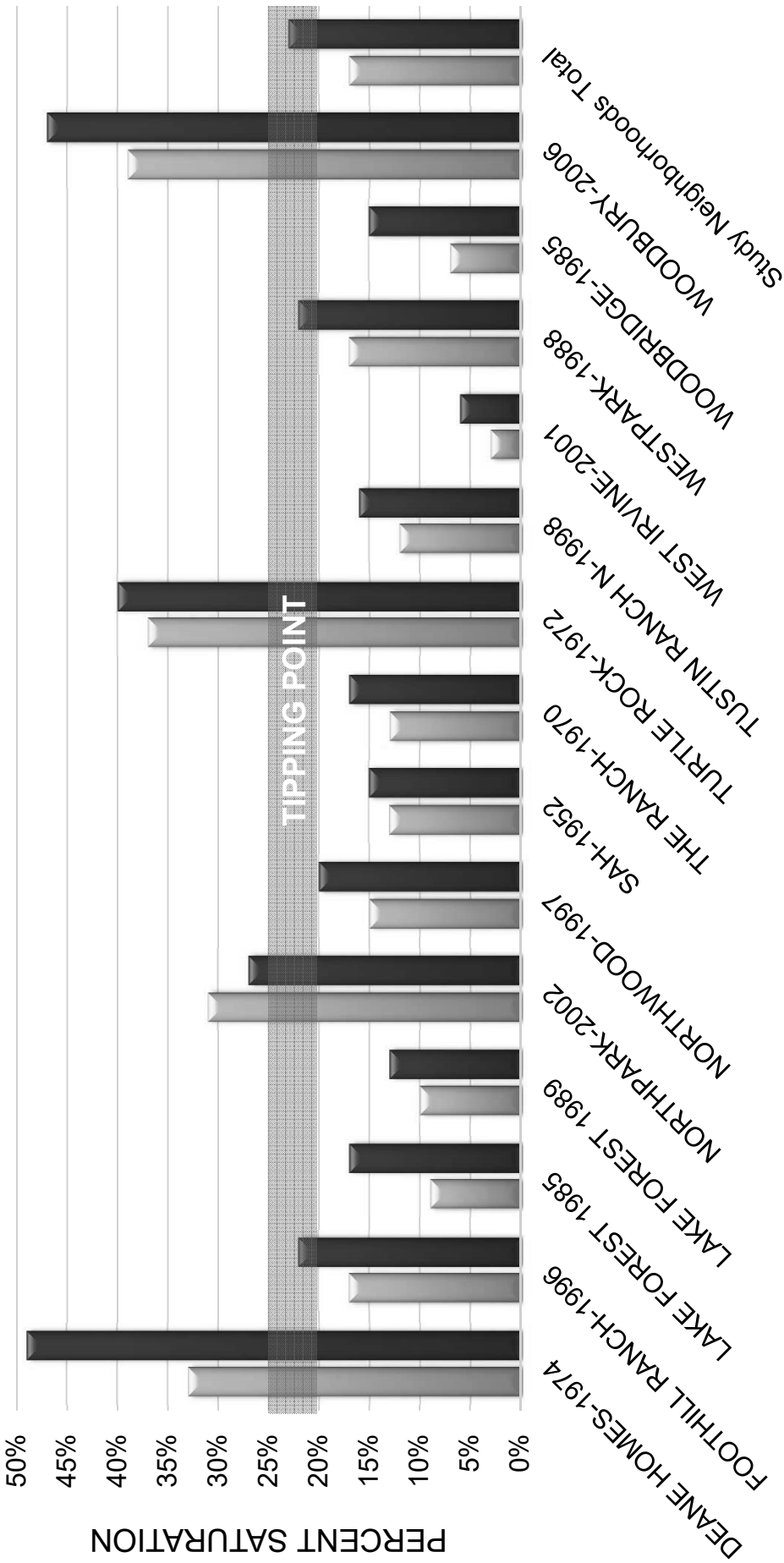
2016 Update Findings – Multiplier and Saturation

- Multiplier effect
 - 2012 through 2016 non-rebators and rebators
 - Multiplier of **2.24**
 - Every 7 rebate participants = approx. 16 non-rebate participants
- Saturation of study area
 - 23% conversion to drought tolerant landscapes
 - 6% one year rate of change



Saturation by Neighborhood

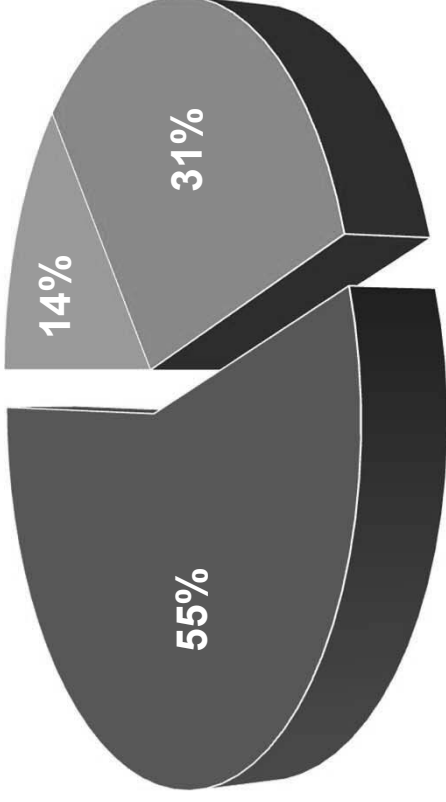
SATURATION BY NEIGHBORHOOD



■ 2015 without Brown Lawns ■ 2016 without Brown Lawns

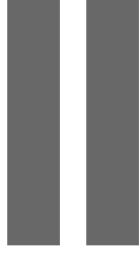
2016 Update – Tracking Brown Lawns

- Brown lawns from 2015 – What happened to them?



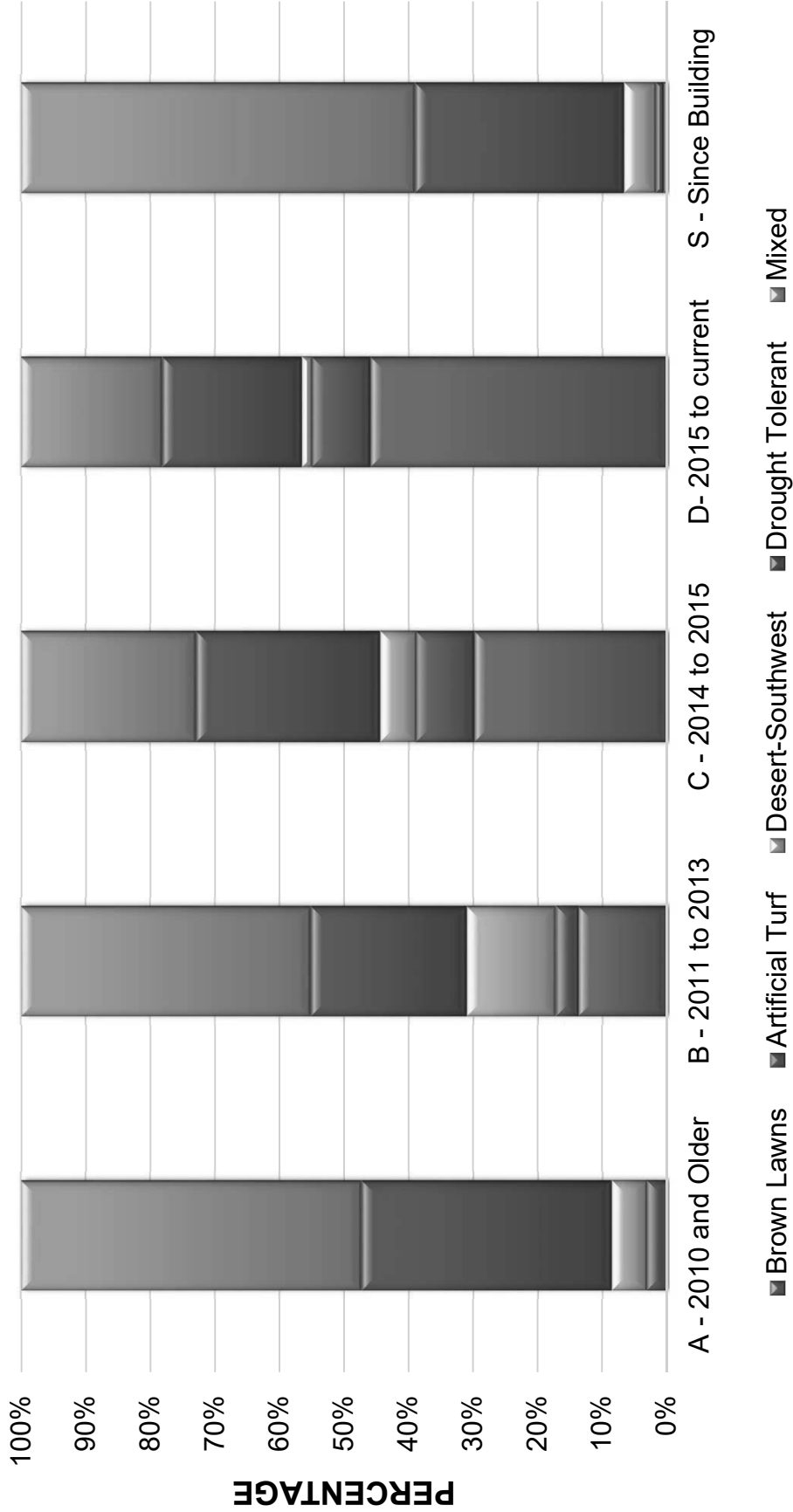
- Changed to drought friendly landscaping in 2016
- Reverted to turf / grass in 2016
- Unchanged in 2016

Demographic Trends



Landscape Preference Over Time

DROUGHT TOLERANT LANDSCAPE PREFERENCE OVER TIME



Next Steps

- Density analysis of specific landscape types
- Assess variation in neighborhood response
- Compare results with large scale studies of land cover change
- Project multiplier effect into the future
- Incorporate findings into IRWD's rebate program





Thank You!

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