Introduction to Low Impact Development

2016 Stormwater Summit, May 3, 2016

Pima County, Marie Light, Principal Hydrologist

Topics

What does LID solve?

Methods of Implementation

Evolution of Technology

Community Response

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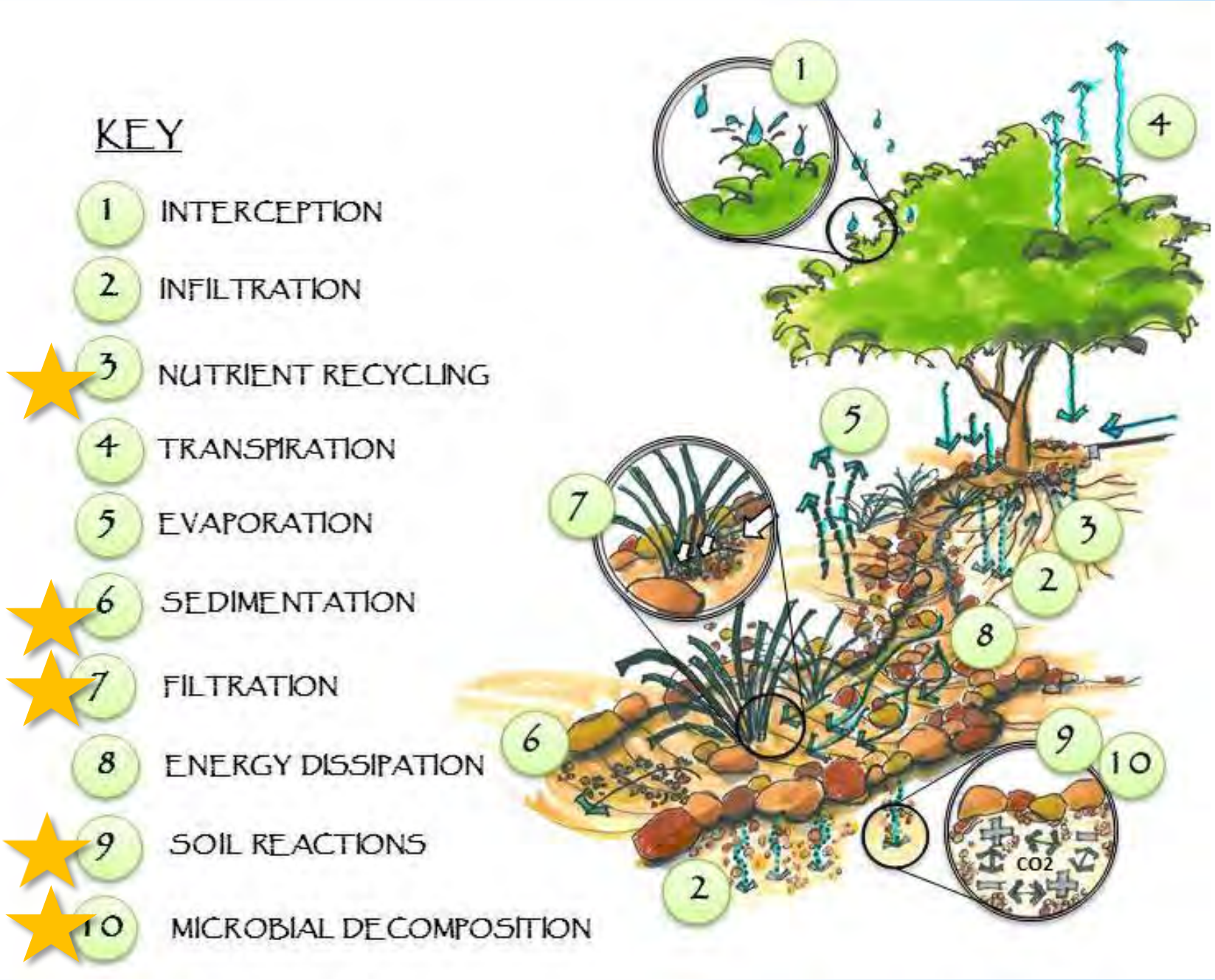
What does LID solve?

1. Clean stormwater
2. Reduce flooding
3. Create greenery and shade

Natural Processes Clean Storm Water



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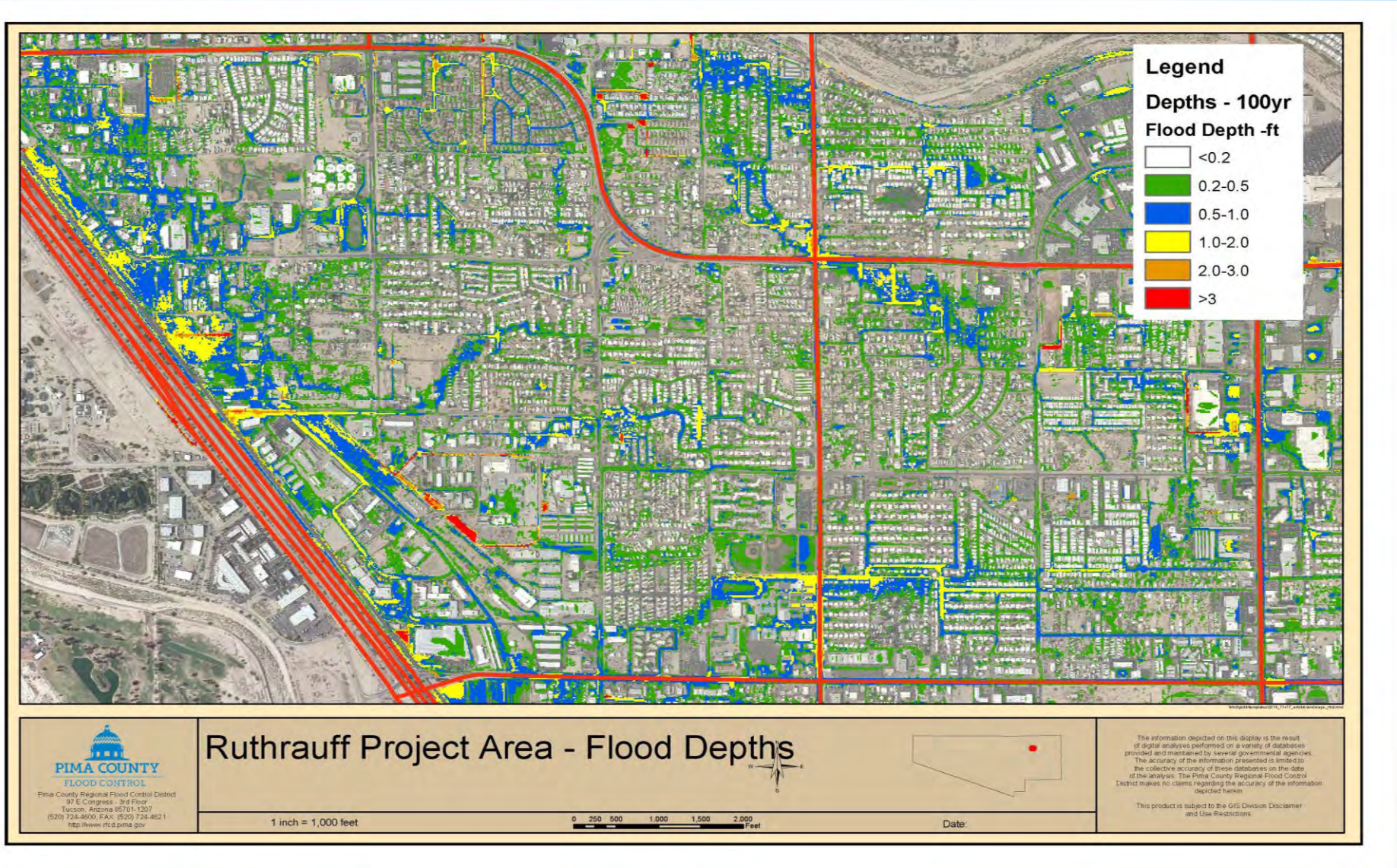
Reduce flooding



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Create Greenery and Shade

Canopy shade reduces temperature

* Walls and roofs by 20 - 40°F
* Vines on walls by 36°F
* Inside a parked car by 45°F

Plant evapotranspiration reduces temperature

* Open terrain by 9°F
* Suburbs without trees 4 - 6°F

(McPherson et al., 2005; Sandifer et al, 2001)

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Methods of Implementation

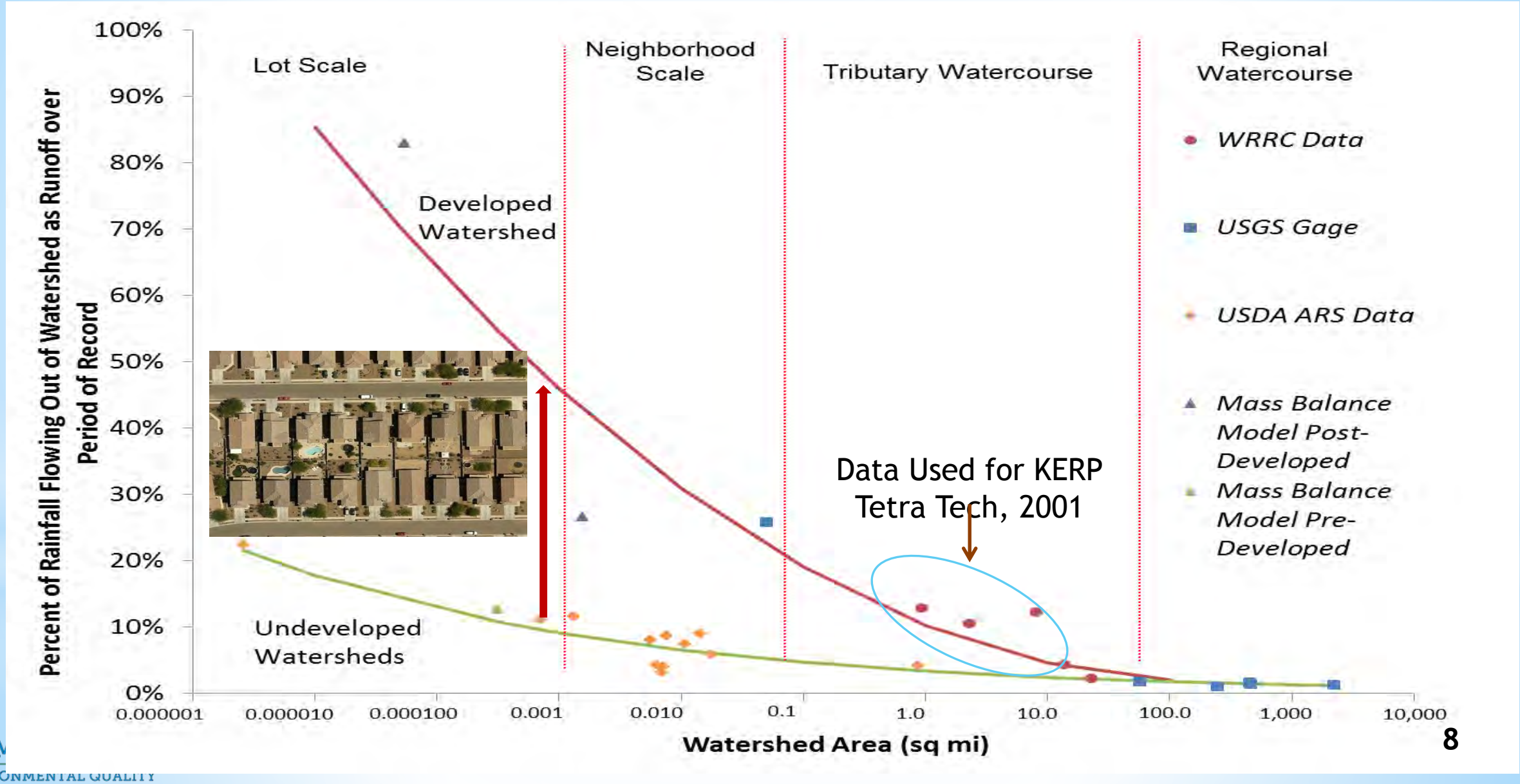
Technical tools for professionals

- Harvestable water
- Natural hydrologic function
- Native or low-water use plants

Appealing Case Studies

- Commercial
- Industrial
- Institution
- Recreation
- Residential
- Transportation

‘Harvestable Water’ (Stormwater/ Rainwater)



Graph updated from City/County Water Study *Stormwater as a Supplemental Water Source*, May 2009

Re-establish Natural Hydrologic Functions

Low Impact Development Features

Structural

- Stormwater harvesting basins
- Vegetated rock swales
- Chicanes
- Bioretention
- Infiltration areas
- Cisterns
- Permeable pavers & pavement

Practices

- Native, low-water use plants
- Drip irrigation, water sensors
- Maintenance
- Plant for shade

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Case Study Structure

Information

Data

Goals

Cost

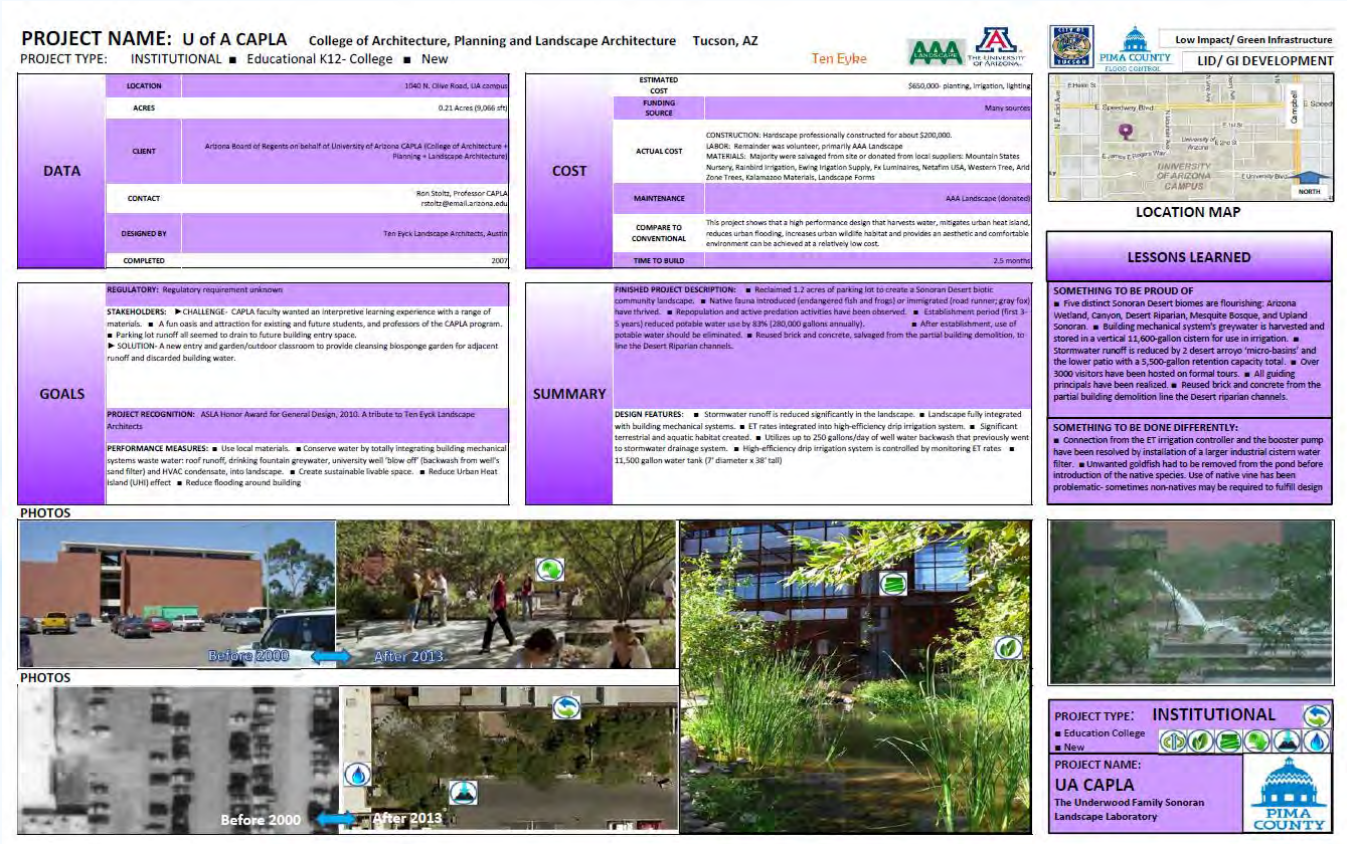
Summary

Lessons Learned

Graphics

Before and after pictures

Location Map



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Case Study - Data and Goals

Data

- Location and acreage
- Client and designer
- Date of completion

Goals

- Regulatory
- Stakeholders
- Recognition
- Performance measures

PROJECT TYPE: INSTITUTIONAL ■ Educational K12- College ■ New

DATA	LOCATION	1040 N. Olive Road, UA campus
	ACRES	0.21 Acres (9,066 sft)
	CLIENT	Arizona Board of Regents on behalf of University of Arizona CAPLA (College of Architecture + Planning + Landscape Architecture)
	CONTACT	Ron Stoltz, Professor CAPLA rstoltz@email.arizona.edu
	DESIGNED BY	Ten Eyck Landscape Architects, Austin
	COMPLETED	2007

GOALS	**REGULATORY:** Regulatory requirement unknown
	STAKEHOLDERS: ►CHALLENGE- CAPLA faculty wanted an interpretive learning experience with a range of materials. ■ A fun oasis and attraction for existing and future students, and professors of the CAPLA program. ■ Parking lot runoff all seemed to drain to future building entry space. ► SOLUTION- A new entry and garden/outdoor classroom to provide cleansing biosponge garden for adjacent runoff and discarded building water.
	PROJECT RECOGNITION: ASLA Honor Award for General Design, 2010. A tribute to Ten Eyck Landscape Architects
	PERFORMANCE MEASURES: ■ Use local materials. ■ Conserve water by totally integrating building mechanical systems waste water: roof runoff, drinking fountain greywater, university well 'blow off' (backwash from well's sand filter) and HVAC condensate, into landscape. ■ Create sustainable livable space. ■ Reduce Urban Heat Island (UHI) effect ■ Reduce flooding around building

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Case Study - Cost & Summary

Cost

- Estimated cost & actual cost
- Funding source
- Time to build
- Maintenance

Summary

- Finished description
- Design Features

COST	ESTIMATED COST	$650,000- planting, irrigation, lighting
	FUNDING SOURCE	Many sources
	ACTUAL COST	CONSTRUCTION: Hardscape professionally constructed for about $200,000. LABOR: Remainder was volunteer, primarily AAA Landscape MATERIALS: Majority were salvaged from site or donated from local suppliers: Mountain States Nursery, Rainbird Irrigation, Ewing Irigation Supply, Fx Luminaires, Netafim USA, Western Tree, Arid Zone Trees, Kalamazoo Materials, Landscape Forms
	MAINTENANCE	AAA Landscape (donated)
	COMPARE TO CONVENTIONAL	This project shows that a high performance design that harvests water, mitigates urban heat island, reduces urban flooding, increases urban wildlife habitat and provides an aesthetic and comfortable environment can be achieved at a relatively low cost.
	TIME TO BUILD	2.5 months

SUMMARY	**FINISHED PROJECT DESCRIPTION:** ■ Reclaimed 1.2 acres of parking lot to create a Sonoran Desert biotic community landscape. ■ Native fauna introduced (endangered fish and frogs) or immigrated (road runner; gray fox) have thrived. ■ Repopulation and active predation activities have been observed. ■ Establishment period (first 3-5 years) reduced potable water use by 83% (280,000 gallons annually). ■ After establishment, use of potable water should be eliminated. ■ Reused brick and concrete, salvaged from the partial building demolition, to line the Desert Riparian channels.
	DESIGN FEATURES: ■ Stormwater runoff is reduced significantly in the landscape. ■ Landscape fully integrated with building mechanical systems. ■ ET rates integrated into high-efficiency drip irrigation system. ■ Significant terrestrial and aquatic habitat created. ■ Utilizes up to 250 gallons/day of well water backwash that previously went to stormwater drainage system. ■ High-efficiency drip irrigation system is controlled by monitoring ET rates ■ 11,500 gallon water tank (7' diameter x 38' tall)

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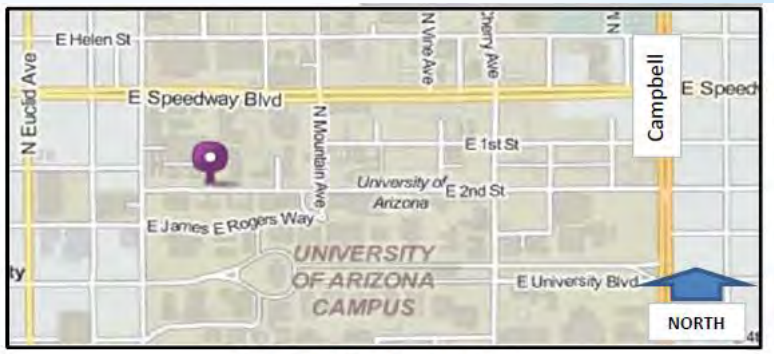
Case Study - Map and Lessons Learned

Location Map

Lessons Learned

- Something to be proud of
- Something to be done differently



LOCATION MAP

LESSONS LEARNED

SOMETHING TO BE PROUD OF

■ Five distinct Sonoran Desert biomes are flourishing: Arizona Wetland, Canyon, Desert Riparian, Mesquite Bosque, and Upland Sonoran. ■ Building mechanical system's greywater is harvested and stored in a vertical 11,600-gallon cistern for use in irrigation. ■ Stormwater runoff is reduced by 2 desert arroyo 'micro-basins' and the lower patio with a 5,500-gallon retention capacity total. ■ Over 3000 visitors have been hosted on formal tours. ■ All guiding principals have been realized. ■ Reused brick and concrete from the partial building demolition line the Desert riparian channels.

SOMETHING TO BE DONE DIFFERENTLY:

■ Connection from the ET irrigation controller and the booster pump have been resolved by installation of a larger industrial cistern water filter. ■ Unwanted goldfish had to be removed from the pond before introduction of the native species. Use of native vine has been problematic- sometimes non-natives may be required to fulfill design

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Case Studies - Pictures to Tell The Story

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Evolution of Technology

- Permeable pavers
- Vectors
- Construction requirements
- Maintenance

Porous Pavers & Pavement

What about mosquitos that host Zika?

Aedes aegypti

Aedes albopictus

Minimize mosquitos that host Zika

* **Life Span 14-21 days**
  - Eggs – Larva: 2-3 days
  - Larva – Pupa 4-5 days
  - Pupa – adult: 1-2 days
* **Interrupt life cycle**
  - Soak water into ground in 1 day*
  - Place mosquito dunk in water standing longer than 5 days

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* Pima County requirement for retention or detention basins

Attention to Design & Maintenance

- Plans need defined elevations
- Clean out structures to remove sediments

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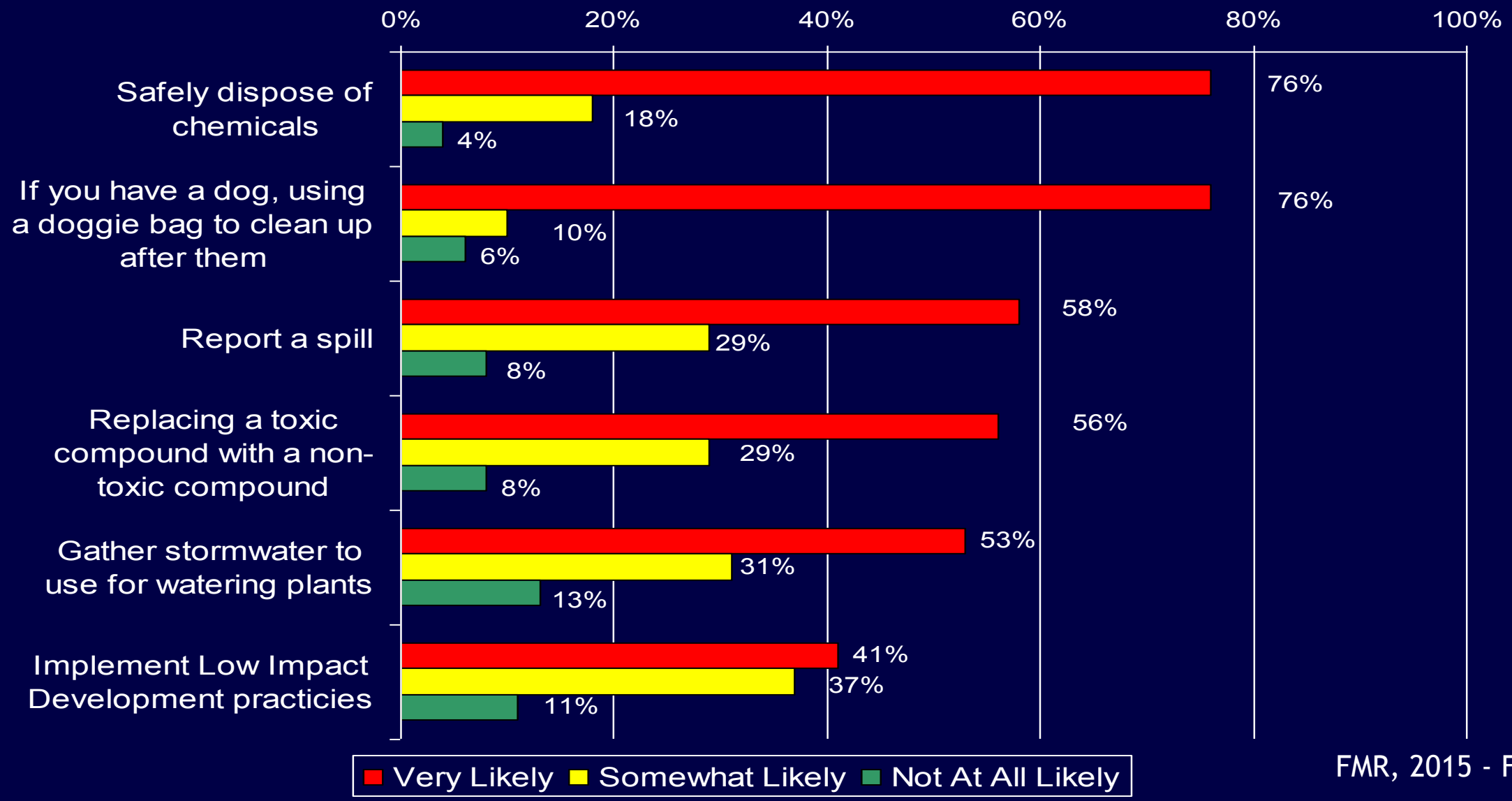
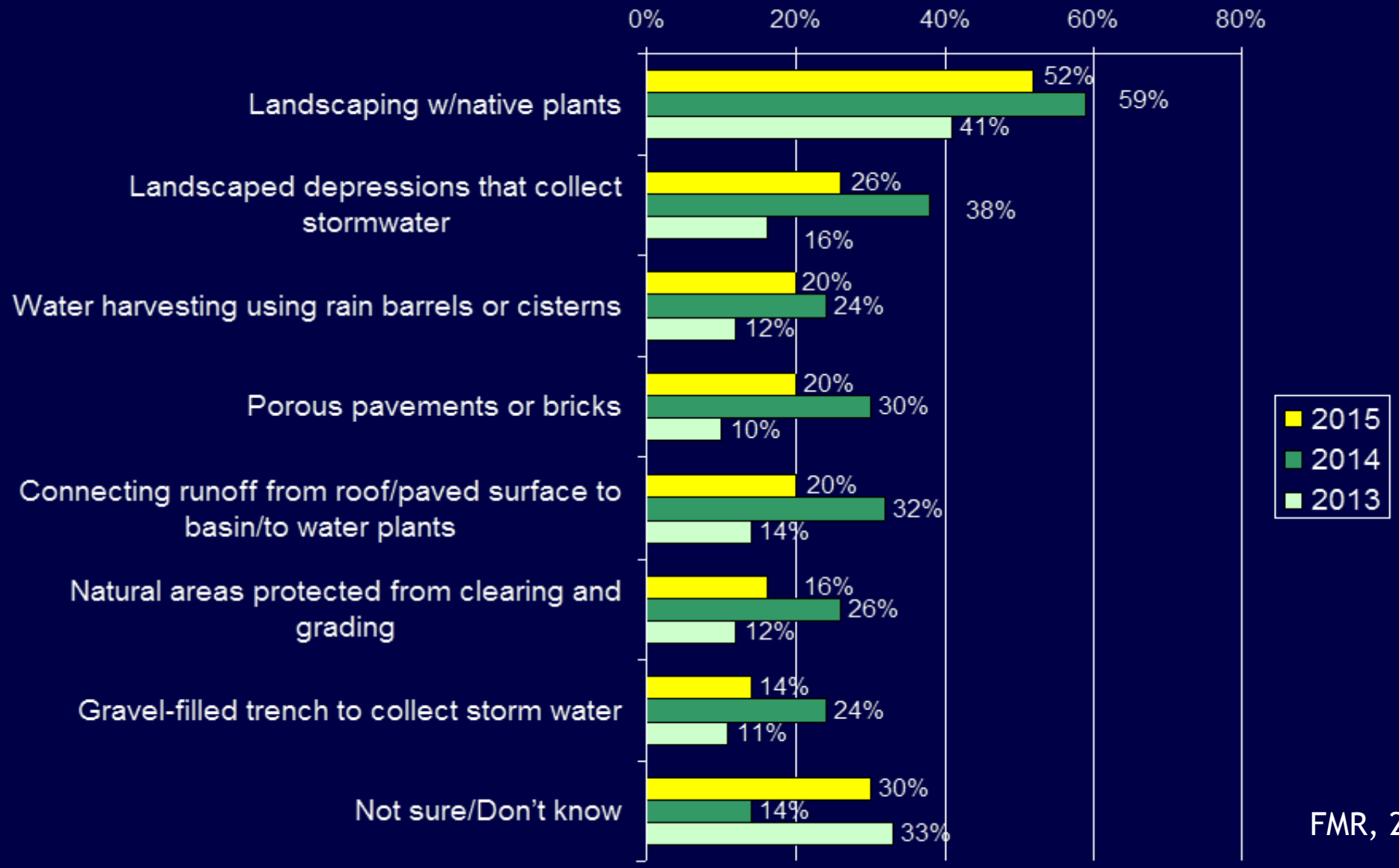
Maintenance

Tell me how likely you would be to take part (very likely, somewhat or not at all) in activities people can do to keep storm water clean.



FMR, 2015 - Fig 34

Tell me if the listed Low Impact Development practice has been implemented or installed at your home or business



FMR, 2015, Fig. 29

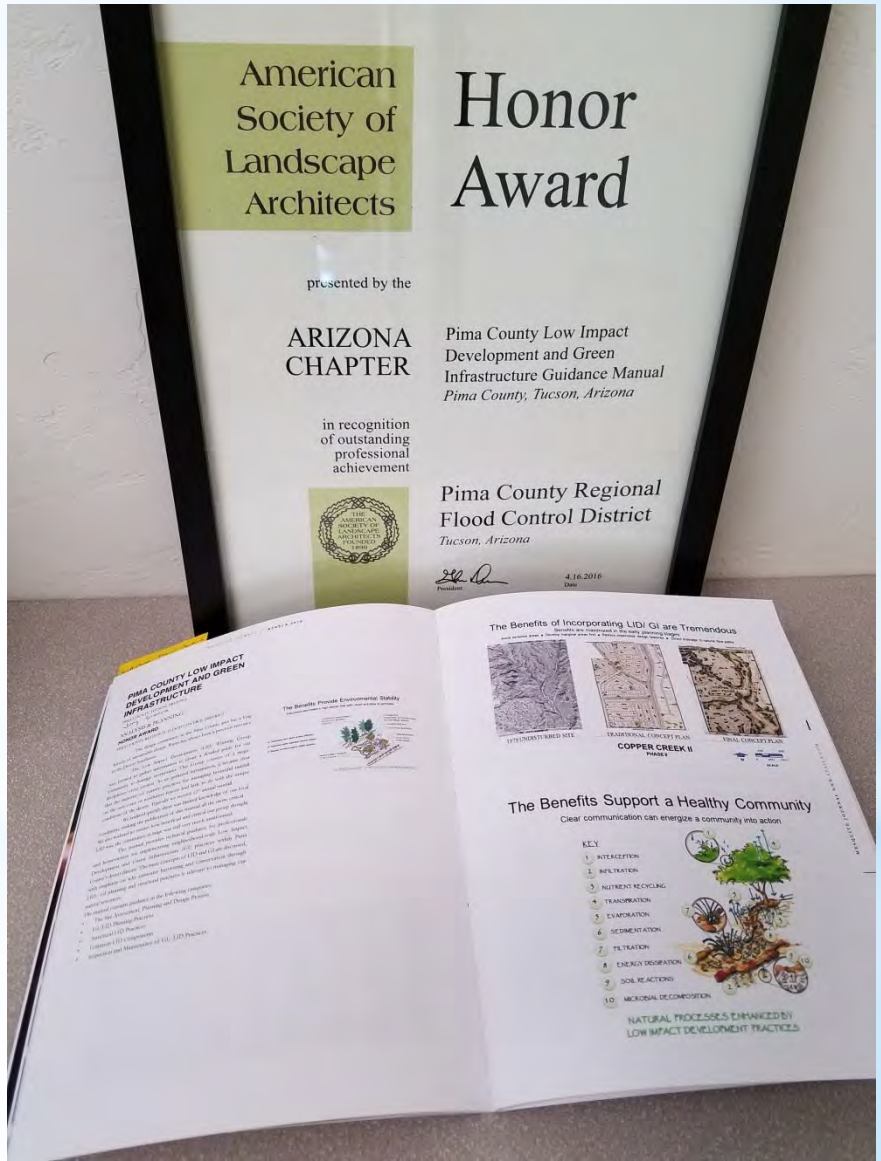
American Society of Landscape Architects Awards

Award of Excellence

- Low Impact Development Toolkit
- Logan Simpson
- City of Glendale, City of Mesa

Honor Award

- Low Impact Development and Green Infrastructure Guidance Manual
- Pima County Regional Flood Control District



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