Introduction to Low Impact Development

2016 Stormwater Summit, May 3, 2016

Pima County, Marie Light, Principal Hydrologist
What does LID solve?
Methods of Implementation
Evolution of Technology
Community Response
What does LID solve?

1. Clean stormwater
2. Reduce flooding
3. Create greenery and shade
Natural Processes
Clean Storm Water

KEY
1. INTERCEPTION
2. INFILTRATION
3. NUTRIENT RECYCLING
4. TRANSPIRATION
5. EVAPORATION
6. SEDIMENTATION
7. FILTRATION
8. ENERGY DISSIPATION
9. SOIL REACTIONS
10. MICROBIAL DECOMPOSITION

PIMA COUNTY ENVIRONMENTAL QUALITY
Reduce flooding
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)
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)

Data Used for KERP
Tetra Tech, 2001

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
Case Study Structure

Information
- Data
- Goals
- Cost
- Summary
- Lessons Learned

Graphics
- Before and after pictures
- Location Map
Case Study - Data and Goals

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

Goals
- Regulatory
- Stakeholders
- Recognition
- Performance measures
Case Study - Cost & Summary

Cost

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

Summary

• Finished description
• Design Features

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**COST**

<table>
<thead>
<tr>
<th>ESTIMATED COST</th>
<th>ACTUAL COST</th>
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<tbody>
<tr>
<td>FUNDING SOURCE</td>
<td>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 Irrigation Supply, Fe Luminaires, Notafilm USA, Western Tree, Arc Zone Trees, Kalamazoo Materials, Landscape Forms</td>
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**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

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**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).
Lesson Learned

- Something to be proud of
- Something to be done differently
Case Studies - Pictures to Tell The Story
Evolution of Technology

• Permeable pavers
• Vectors
• Construction requirements
• Maintenance
Porous Pavers & Pavement
What about mosquitos that host Zika?
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

* Pima County requirement for retention or detention basins
Attention to Design & Maintenance

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

- Safely dispose of chemicals: 4% very likely, 18% somewhat likely, 76% not at all likely.
- If you have a dog, using a doggie bag to clean up after them: 6% very likely, 10% somewhat likely, 76% not at all likely.
- Report a spill: 8% very likely, 29% somewhat likely, 58% not at all likely.
- Replacing a toxic compound with a non-toxic compound: 8% very likely, 29% somewhat likely, 56% not at all likely.
- Gather stormwater to use for watering plants: 13% very likely, 31% somewhat likely, 53% not at all likely.
- Implement Low Impact Development practices: 11% very likely, 37% somewhat likely, 41% not at all likely.
Tell me if the listed Low Impact Development practice has been implemented or installed at your home or business.

- Landscaping w/native plants: 52% (2015), 41% (2014), 59% (2013)
- Landscaped depressions that collect stormwater: 26% (2015), 16% (2014), 38% (2013)
- Water harvesting using rain barrels or cisterns: 20% (2015), 24% (2014), 21% (2013)
- Porous pavements or bricks: 20% (2015), 20% (2014), 30% (2013)
- Connecting runoff from roof/paved surface to basin/to water plants: 14% (2015), 14% (2014), 32% (2013)
- Natural areas protected from clearing and grading: 14% (2015), 16% (2014), 26% (2013)
- Not sure/Don’t know: 14% (2015), 14% (2014), 33% (2013)

FMR, 2015, Fig. 29
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