Identifying Key Areas in the City of Phoenix for Stormwater Infiltration & Retention using Low Impact Development

For City of Phoenix, Environmental Quality Commission
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Study Purpose

Develop collaborative partnerships:

1. Assess stormflow, infiltration, heat and air quality conditions within City of Phoenix
2. Develop plans using Low Impact Development (LID) to enhance urban environment

Plan of Study

1. Conduct suitability analysis – select potential lands
2. Collaboratively develop criteria – assess selected lands
3. Model options – current/future, without/with LID treatment
4. Prepare Report

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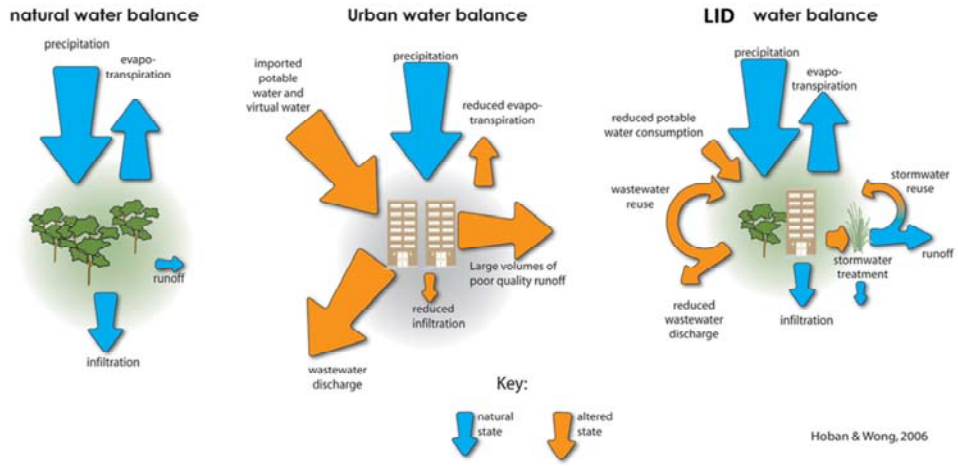
Stormwater Cycle of Natural, Urban, and Urban LID Treatment Conditions



Hoban & Wong, 2006

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Plan of Study - Details

I. Catchment Suitability Analysis

Water detention/retention:

- Reduce peak storm flows
- Reduce sediment transport
- Support native vegetation

Infiltration:

- Restore pre-development infiltration
- Support sub-surface flows and soil health

II. Collaboratively Develop Criteria:

Heat:

Extreme heat vulnerability

Flood Risk:

Localized flood issues

Air Quality:

Vegetation to improve air quality

Sediment Transport:

Localized sedimentation issues

III. Modeling:

Optimum LID features

Optimum LID feature placement

Results under current conditions

Predictive results using LID treatments

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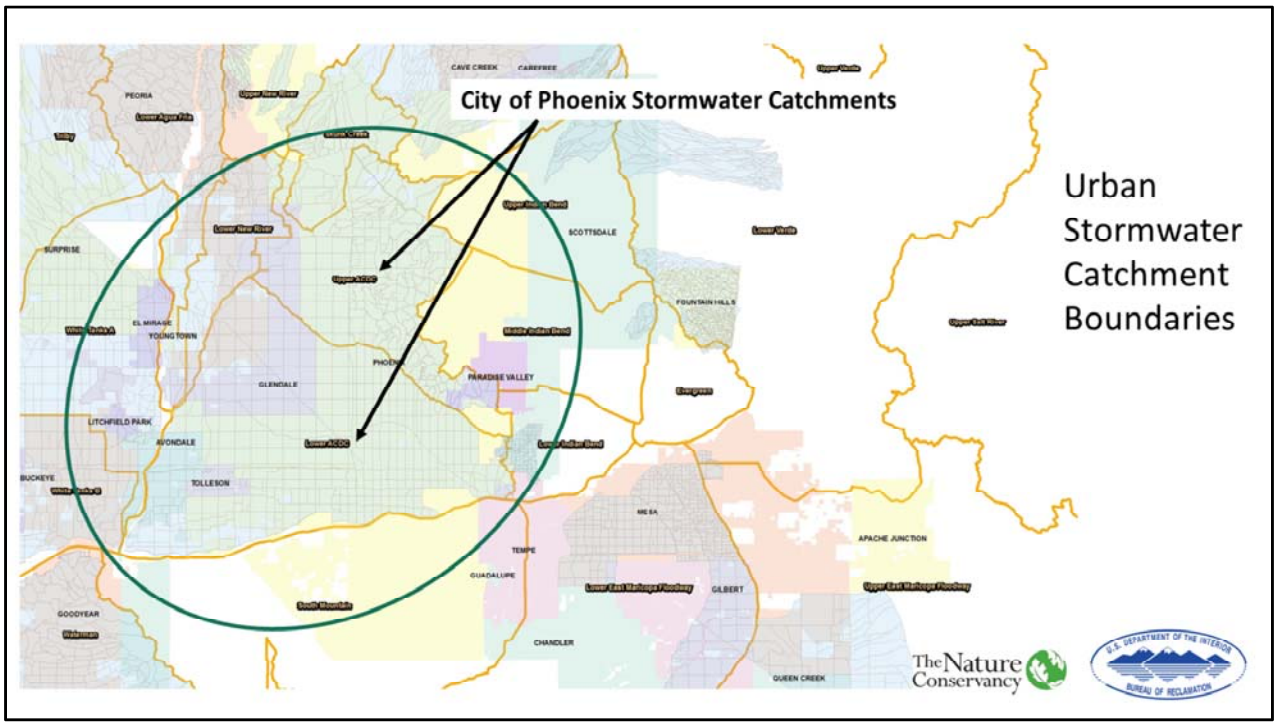
Why GIS spatial analysis?

- Store and process large amounts of data/information
- Assess all criteria and ranking to identify best areas for detention and infiltration
- Locate areas with high need for benefits
- Use collaboratively developed assessment criteria
- GIS processes large amounts of data, applies ranking and selection criteria and scores site locations for potential selection

- Examples:
    - Bridgeport and Atlanta Eco-Urban Assessments
    - Hazel - Arid Lands Institute, Los Angeles
    - Western Washington Hydrology Model


City of Phoenix Stormwater Catchments
Urban Stormwater Catchment Boundaries
CAVE CREEK
CAREFREE
PEORIA
SCOTTSDALE
SURPRISE
EL MIRAGE
YOUNGTOWN
GLENDALE
PHOENIX
PARADISE VALLEY
FOUNTAIN HILLS
LITCHFIELD PARK
AVONDALE
TOLLESON
BUCKEYE
MESA
TEMPE
GUADALUPE
GILBERT
APACHE JUNCTION
GOODYEAR
CHANDLER
QUEEN CREEK
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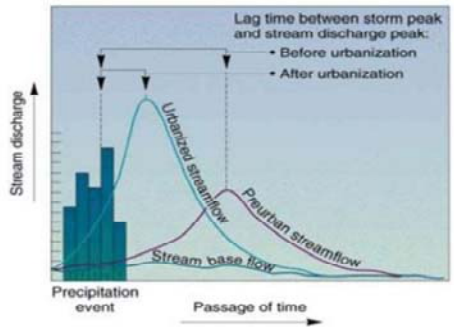
Phoenix Flood September 2014

Michael Chow/The Arizona Republic/AP Photo

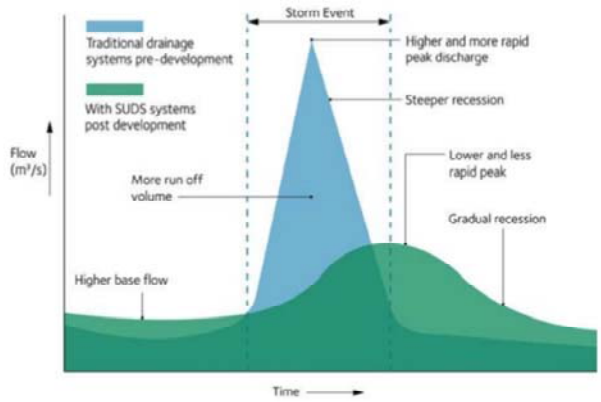
Impacts of LID Installations on Storm Flow

Why LID ? – compare the hydrographs with those before urbanization…



The covering of the land surface by impervious materials means that a much larger proportion of any rainfall forms immediate runoff.

…and then in an urban environment with and without LID



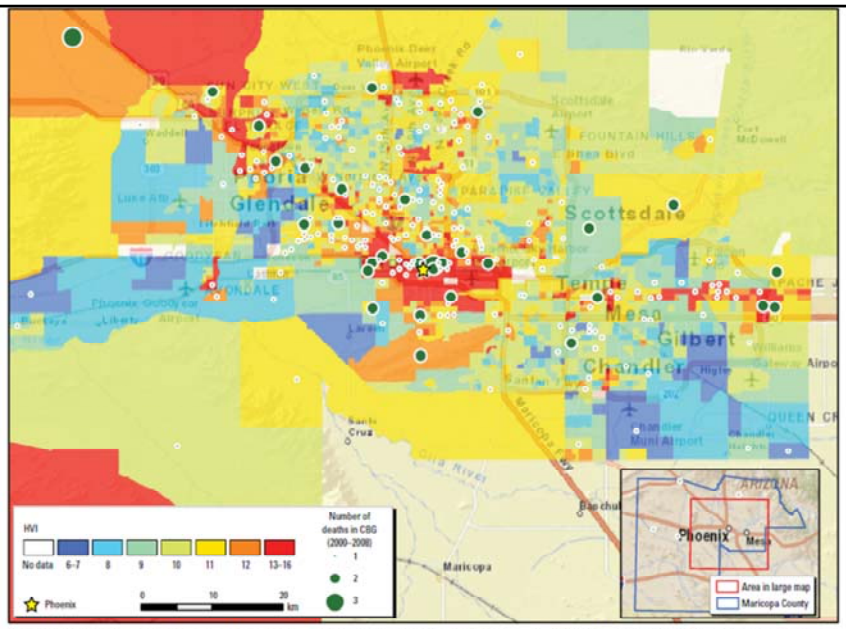


Figure 1. HVI scores (using a method modified from Reid et al. 2009) mapped for 2,081 census block groups (CGBs) in Maricopa County, Arizona. Higher scores represent higher vulnerability. The map inset in the lower right corner indicates the urbanized area of Maricopa County (red box) shown in the larger map. The county, which also contains a much larger area of uninhabited desert and sparse settlement, is outlined in blue. The urbanized area covers all the cities and all but one of the major towns in the county. Residences of only four people who died from heat exposure were located outside the urbanized area (green circles in inset).

Heat Vulnerability

Maricopa County

From Harlan et al., 2013

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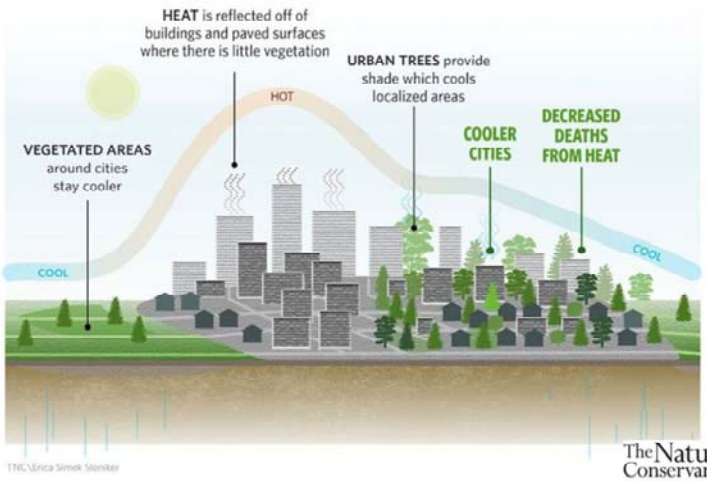
Water from LID Installations Supports Native Vegetation

URBAN TREES, COOLER CITIES

Pavement and concrete in cities absorb energy from the sun and then radiate that energy out, heating the air in cities more than in the surrounding countryside. Urban trees provide shade, preventing pavement and concrete from heating up, and also cool the air by transpiring water. Trees can cool neighborhoods by up to 4 degrees Fahrenheit.



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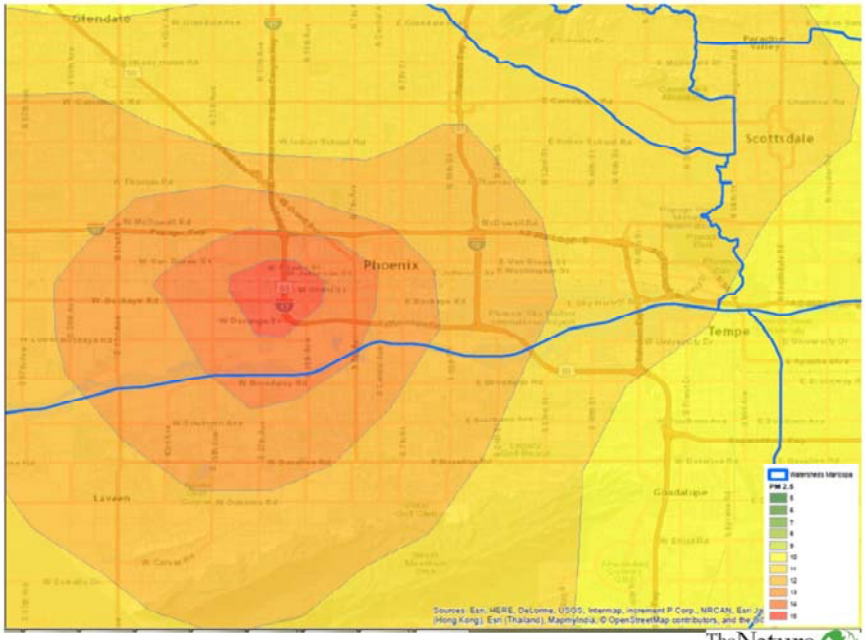
Air Quality

Particulate Matter 2.5

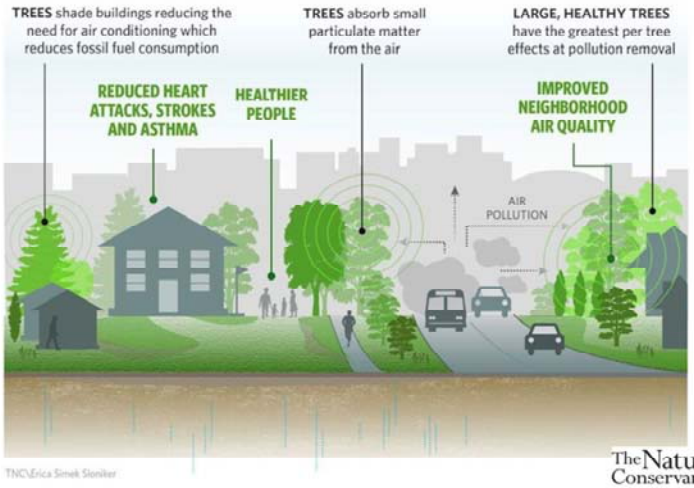
Phoenix Metropolitan Region



Vegetation Improves Air Quality

URBAN TREES, BETTER AIR QUALITY

Trees in cities can remove up to a quarter of the particulate matter pollution in their immediate vicinity. And when planted between a source of pollution and an apartment building, school or hospital, urban trees can help protect human health.



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Floodplain Watershed Restoration Study
Cost Share Agreement

- Proposed Partners: US Bureau of Reclamation, The Nature Conservancy, City of Phoenix, Flood Control District of Maricopa County

- Duration of Study: 3 years

- Cost Share: 50 percent federal cost share and 50 percent non-federal cost share - in-kind contributions
  i. Attend meetings
  ii. Plan
  iii. Provide data/information
  iv. Assess
  v. Review

- Funds:

i. Reclamation $50,000 per year
ii. TNC $40,000 per year
iii. Non-federal cost share minimum of $10,000 per year

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Questions/Contacts

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LID Results

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