Stormwater Management: Adapting to Drought

Pima County | Local Drought Impact Group | May 8, 2013

How much are trees lining a street worth?

Scarce Water

Collect Rain Water

Adapt to Drought Conditions Using Stormwater as a Resource

Drought conditions

- Higher intensity rainfall
- Higher erosion rates
- Warmer temperatures
- Less frequent rains

Irrigate plants with stormwater

- Collect runoff
- Clean runoff
- Cool the environment
- Accumulate water

Collect rainwater and runoff

Gather runoff from roads into chicanes

Concentrate flow behind earthen structures,
such as boomerang berms

Clean runoff

Filtering through check dams

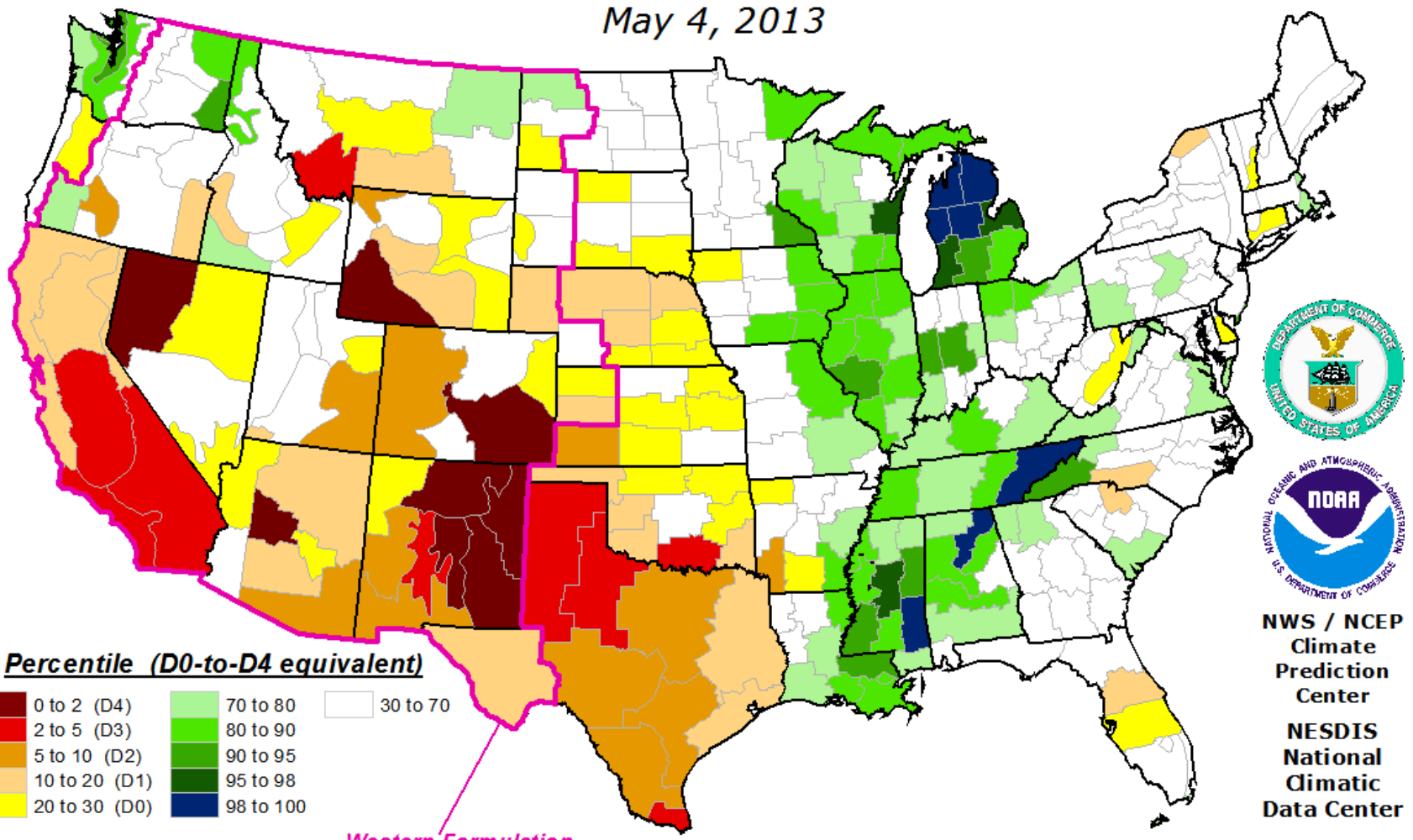
Settling sediments in low areas

Cool

- 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 air temperature from
  - Open terrain by 9°F
  - Suburbs without trees 4 - 6°F

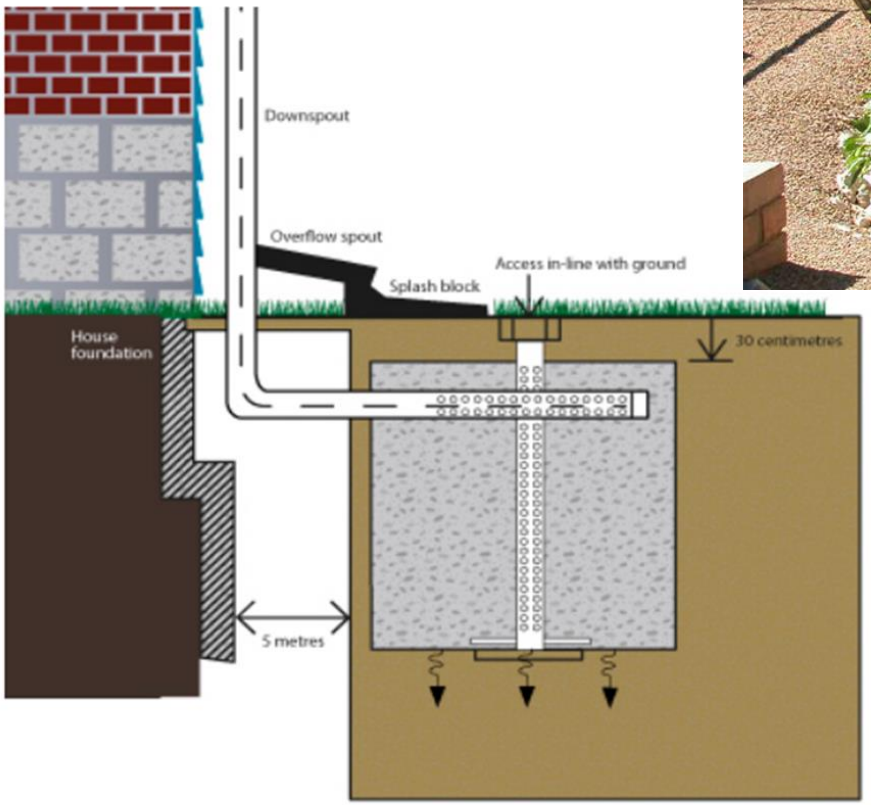
(McPherson et al., 2005)

Long-Term Drought Indicator Blend Percentiles



Accumulate water

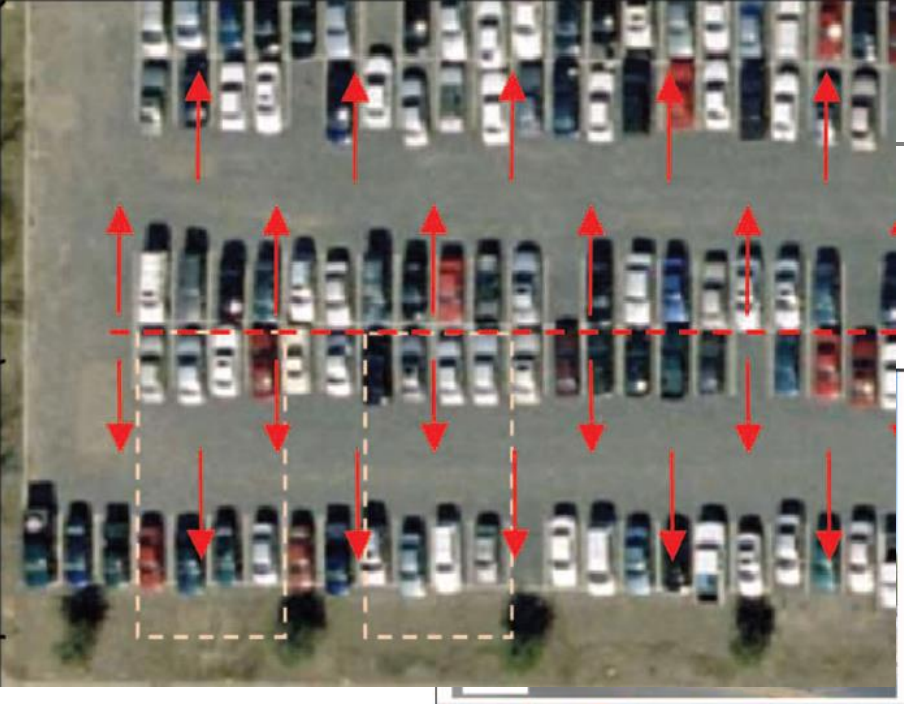
Below ground
Treatment and
storage



Above ground storage

Case Study #1

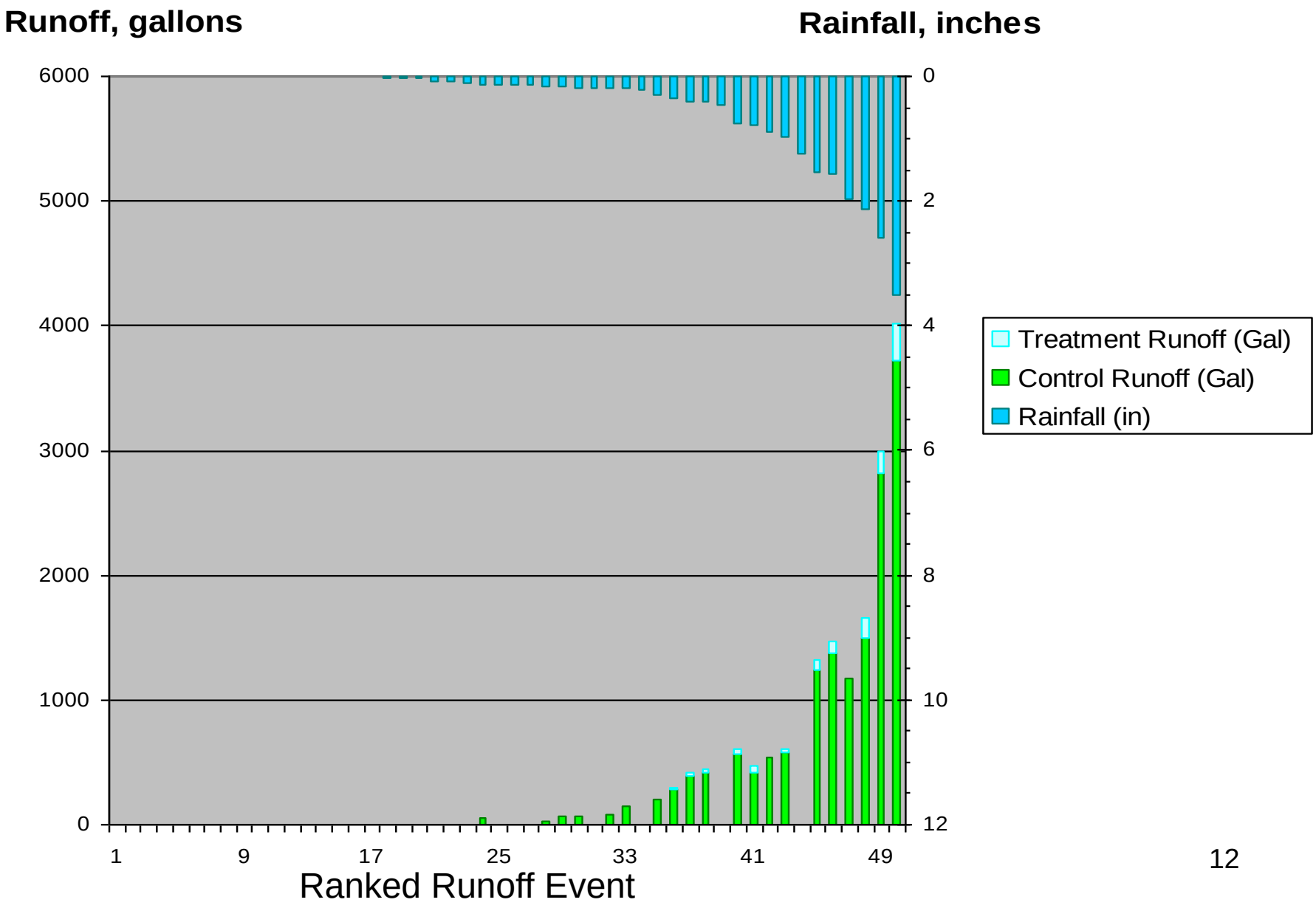
Parking Lot w/ engineered soil, Davis CA



LID components

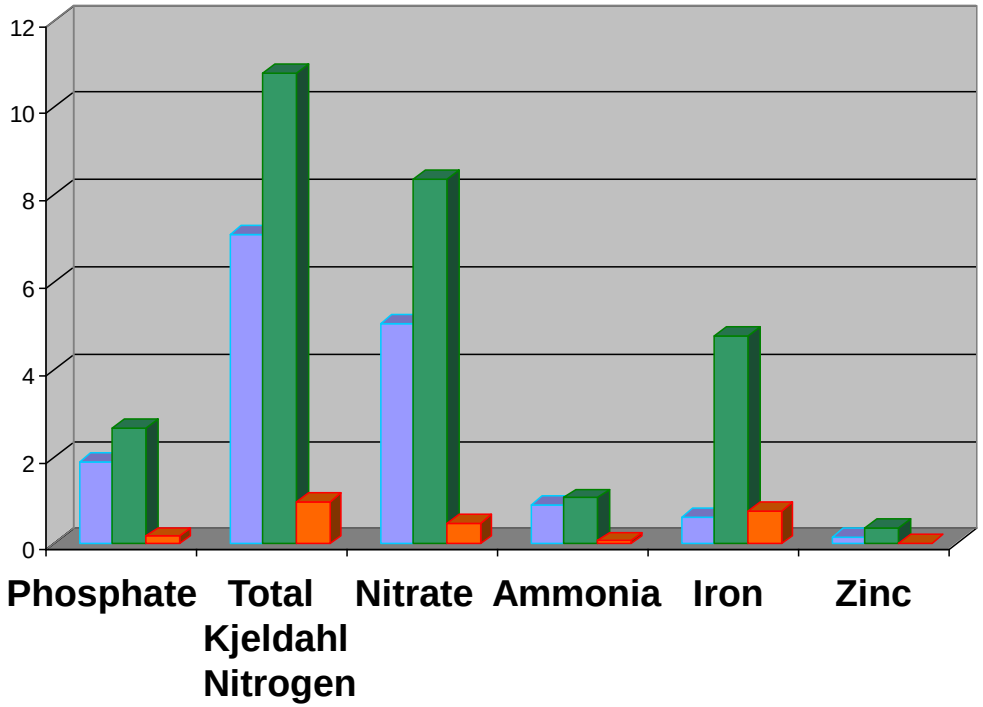
- 2’x34‘x3’ pit
- Geotextile
- Crushed lava
- Compact soil
- Mulch

Water at the Study Site: LID reduced runoff by 89%

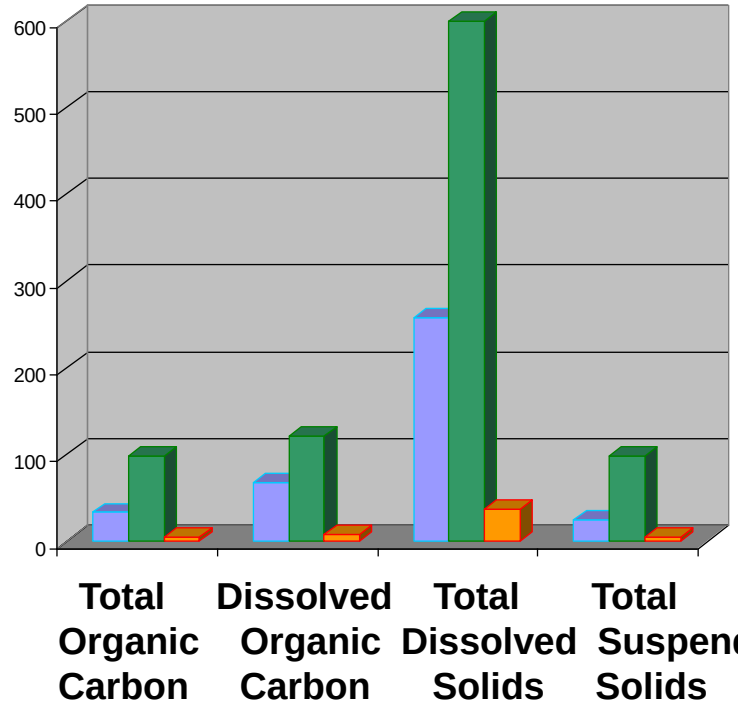


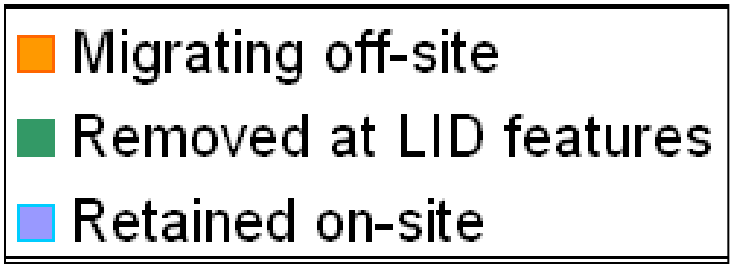
Pollutants at the site: LID reduced pollutants by 95%

Concentration, mg/L



Concentration, mg/L





Case Study #2

5 Cities creating urban forests: What is the benefit of an urban forest?

Model (STRATUM)

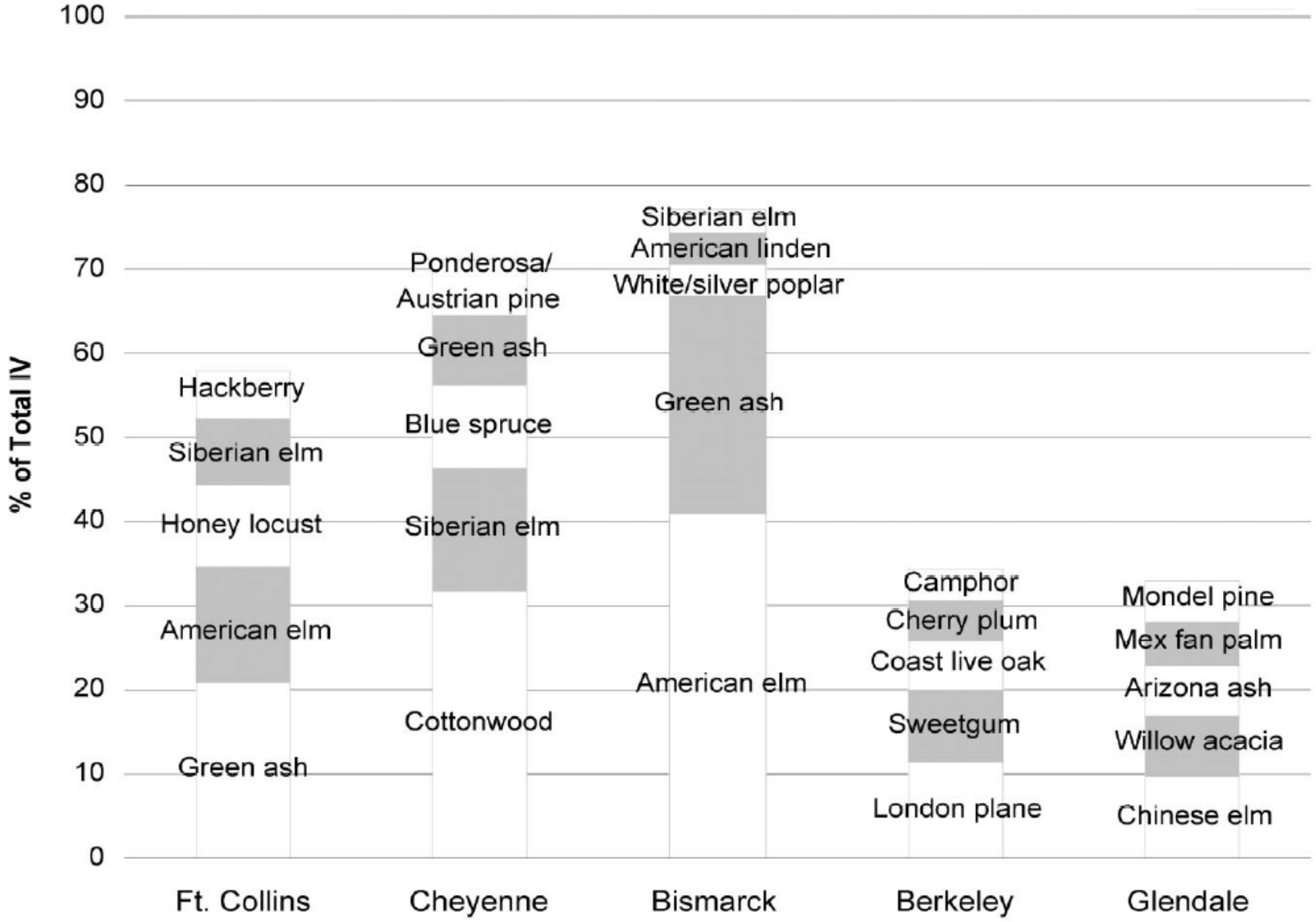
- Tree
  - age, size, leaf area, biomass
  - growth rates
  - health
- Site conditions, sidewalk damage
- City maintenance cost 2003-2005

Evaluation criteria

- Energy savings
- Atmospheric CO_2 reductions
- Air quality benefits
- Stormwater runoff reductions
- Aesthetics
- Price

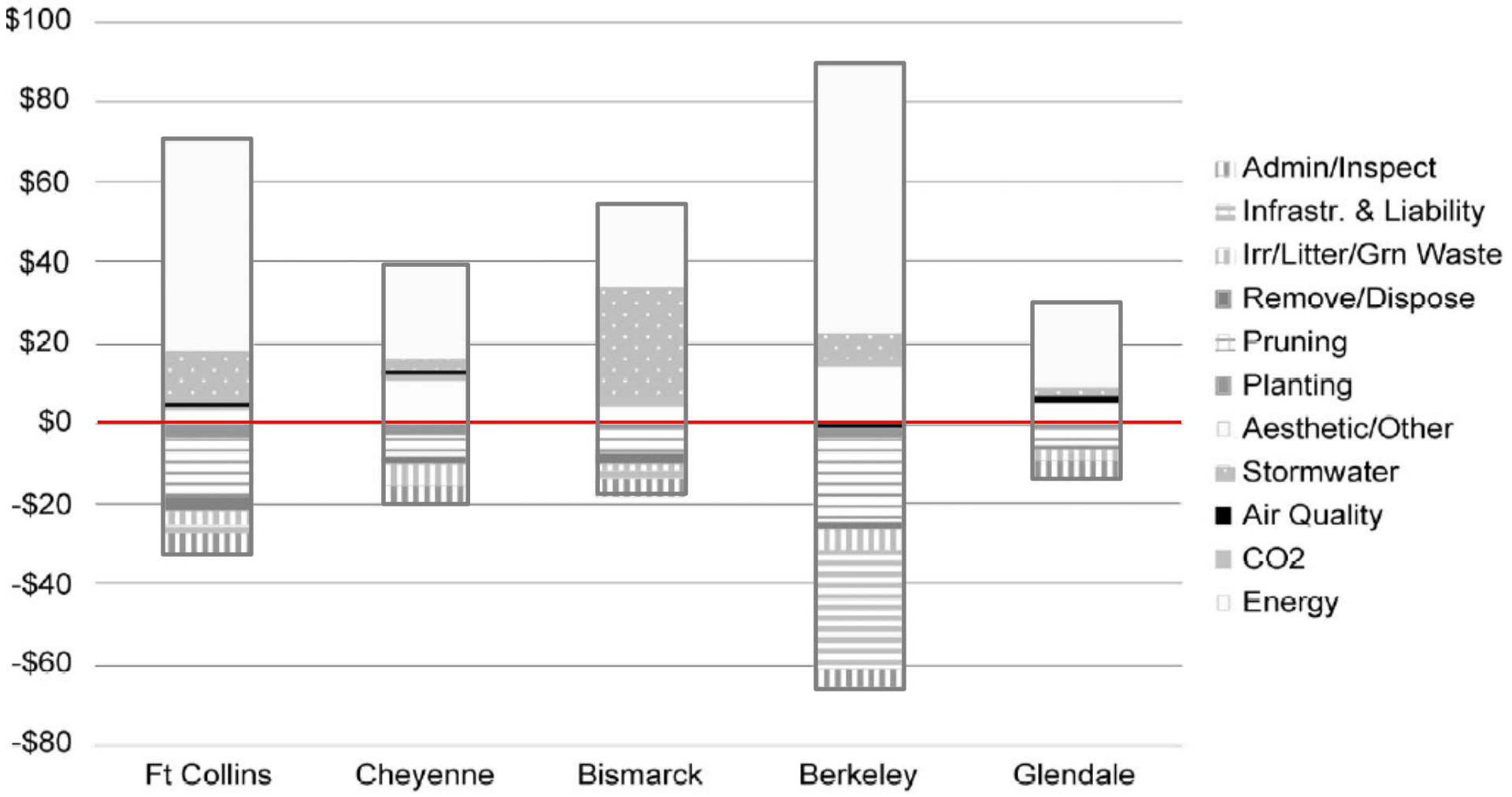
How does the forest structure enhance future benefits?

Top 5 species in Two year (2003-2005) Study



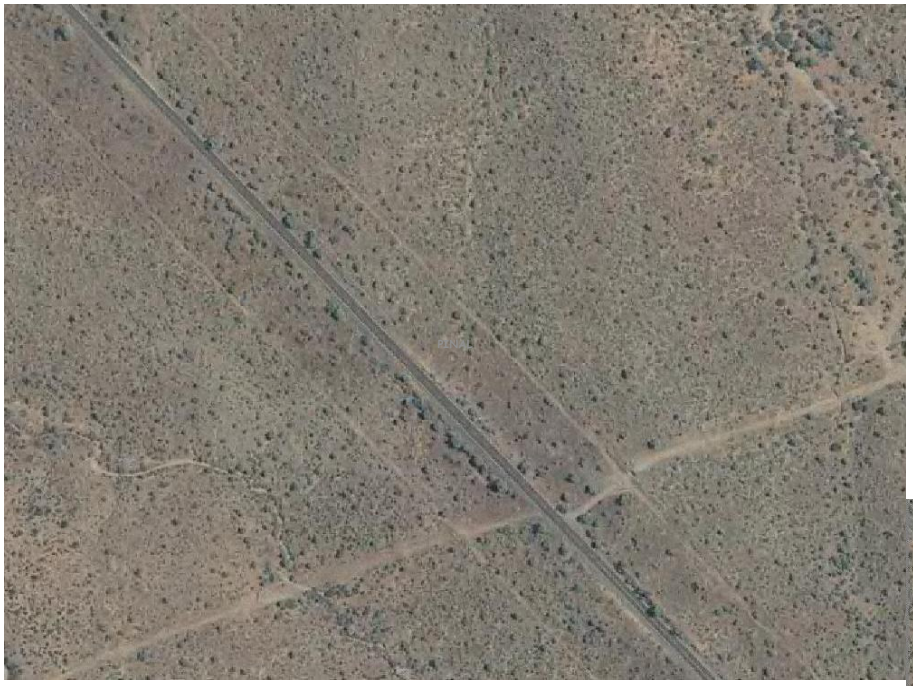
McPherson et al, 2005

Average Annual Benefits and costs per tree in each City



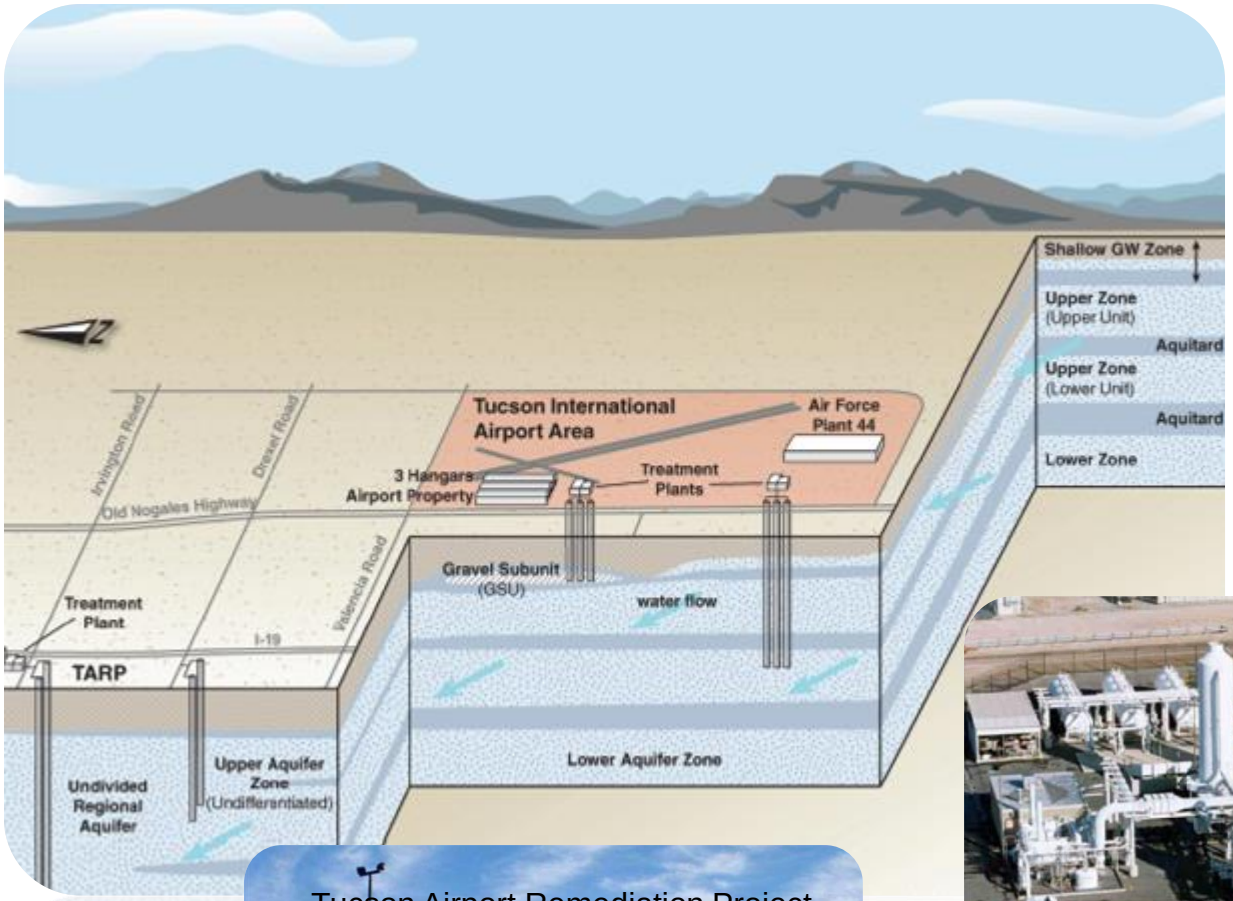
McPherson et al, 2005

Tree Growth along State Route 79 between Oracle Junction and Florence



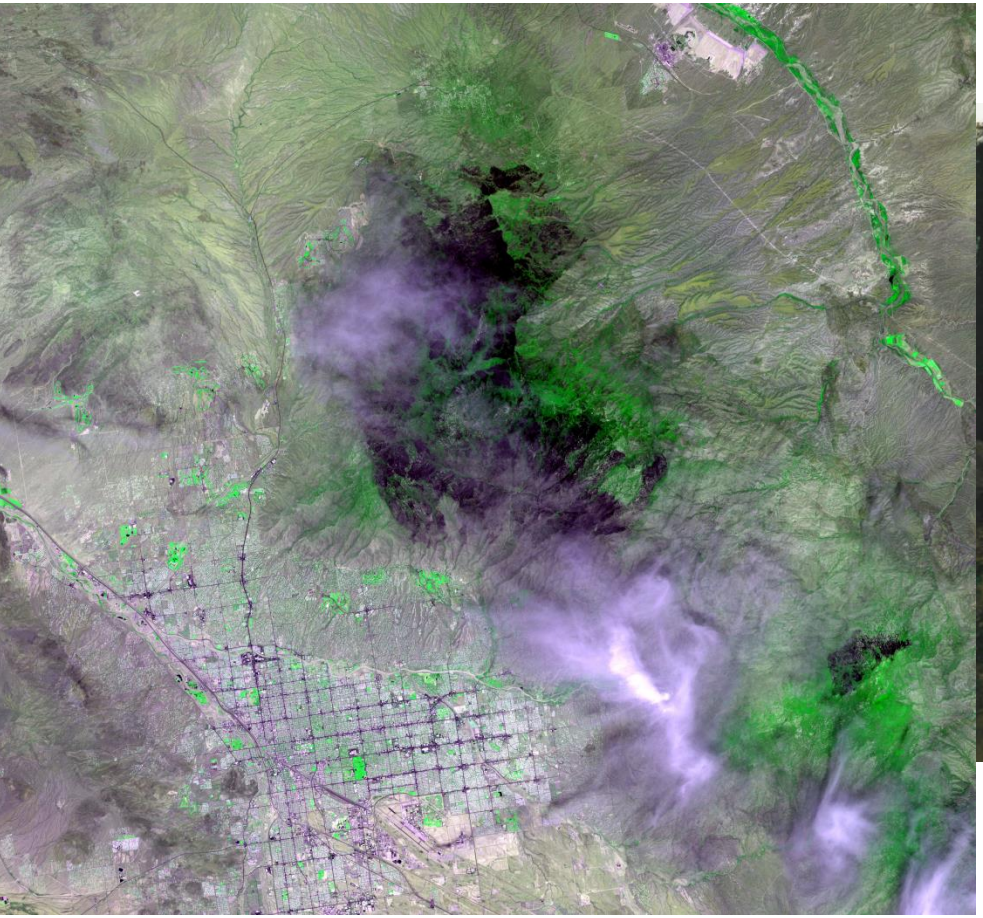
If native species do this, what possibilities can we create with stormwater?

Land disposal of hazardous wastes: groundwater remediation at TARP & AFP44



Air Force Plant 44

Warming & earlier spring increase western US Wildfire Activity



Westerling, et al. 2003

- Climate change
  - Temperature
  - Moisture
- New patterns
  - Drought here, flood there
  - Extremes
- Stormwater irrigation
  - Tree planting
- Idea of goodness
  - Images, what to aim
- How to accomplish it
  - LID features
  - Davis study
- Observed change
- Predicted change
- Additional benefits