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ENGINEERING

# Stormwater Harvesting Opportunities in San Diego

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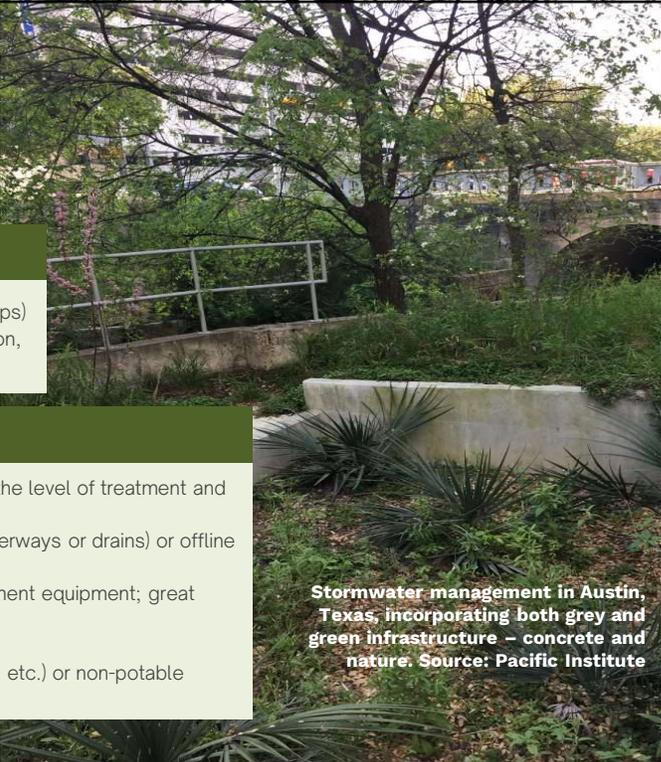
# What is Stormwater Harvesting (Stormwater Reuse)?

## Stormwater Harvesting vs. Rainwater Harvesting

**Rainwater harvesting:** collection of precipitation (primarily from rooftops)  
**Stormwater harvesting:** collection, accumulation, treatment purification, storage and distribution of stormwater (primarily from surface runoff).

## Stormwater Harvesting Considerations

- **End Use:** the intended end use of a capture system will determine the level of treatment and processing needed
- **Collection:** via online storage (acquiring stormwater directly via waterways or drains) or offline storage (weirs that divert stormwater into containment)
- **Treatment:** level of treatment depends on intended use and catchment equipment; great challenge for stormwater harvesting
- **Storage:** consider function, location, capacity
- **Distribution:** open space irrigation (irrigation for parks, golf courses, etc.) or non-potable distribution (toilet flushing, fire fighting, industrial, etc.)



Stormwater management in Austin, Texas, incorporating both grey and green infrastructure – concrete and nature. Source: Pacific Institute

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# Beneficial Uses of Stormwater Harvesting

Indoor Use <small>(requires higher water quality criteria)</small>	Outdoor Use <small>(less stringent water quality criteria)</small>
Flushing <small>(demand is constant; plumbing codes require higher water quality criteria)</small>	Irrigation (most common)
Cooling <small>(avoid higher levels of salinity or hardness = scaling)</small>	Groundwater recharge
Process and boiler water <small>(same as for cooling)</small>	Water features
Drinking water <small>(demand is constant)</small>	Sanitary sewer flushing
	Dust control
	Firefighting
	Wetlands

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# Constraints and Challenges to Stormwater Harvesting

Considerations:

- Human exposure level
- Implementation scale
- Demand characteristics

\*Highest priority is prevention of drinking water contamination/health risk exposure)

San Diego-specific concerns:

- Geology
- Regulations, policies
- Urbanization (infrastructure)
- Climate (reliability/frequency)
- Public perception of harvested water
- Site constraints due to space, cost limitations (especially in fully developed areas)

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## Building Out an Urban Environment

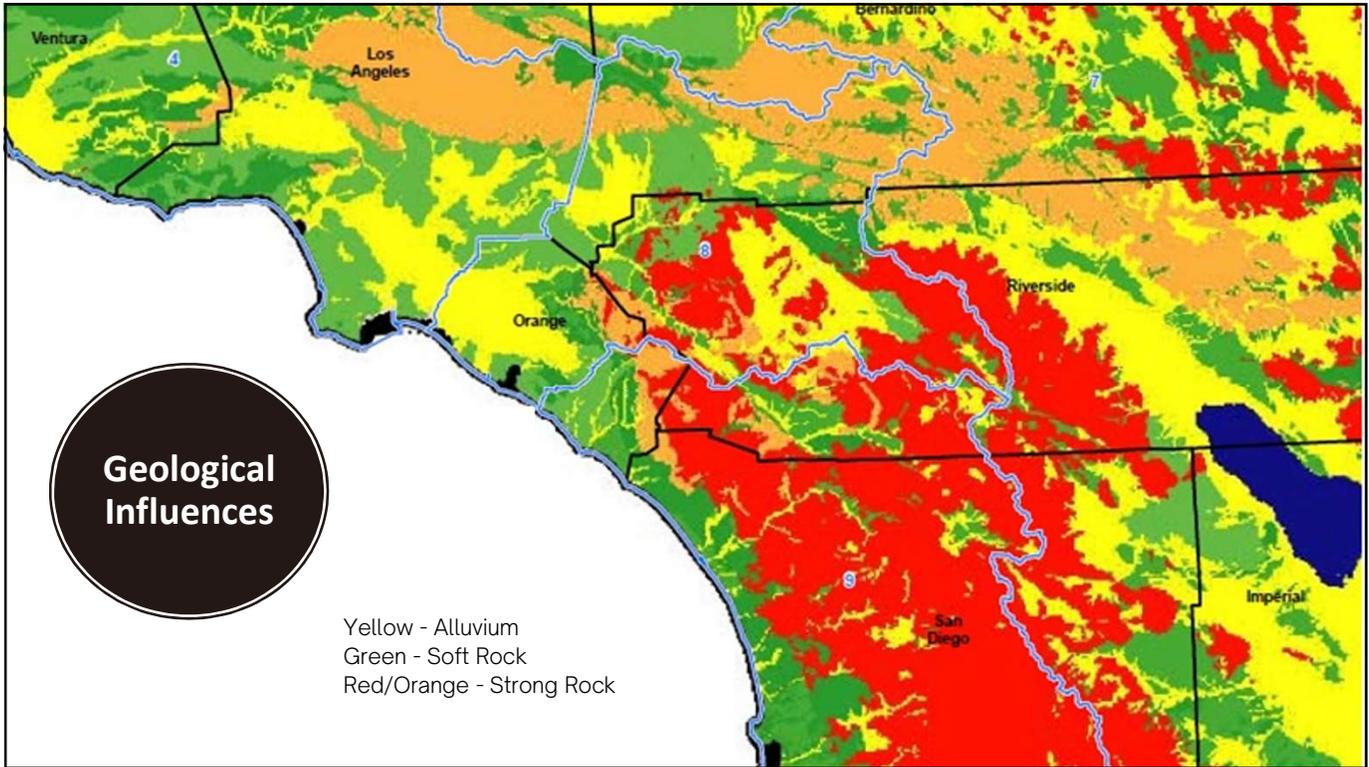
- San Diego is largely built out
  - Most desirable land has been developed
  - More challenging (and costly) lands have yet to be developed
  - Some developed land gets redeveloped
  - New development is often adjacent to existing built environment
- Must carefully consider all potential impacts on both built environment and natural environment

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## Urban Environment

- Established communities have grown around and adapted to environmental conditions and constraints
- Building and development standards were established in recognition of environmental conditions and societal values in the area at the time

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## Urban Environment and Water Supply

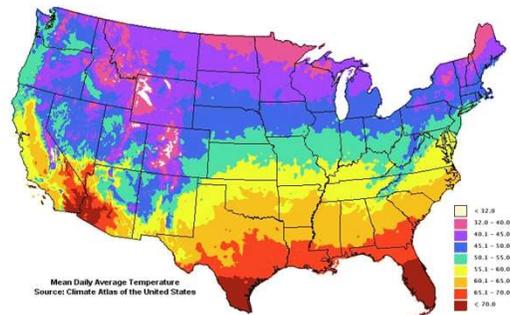
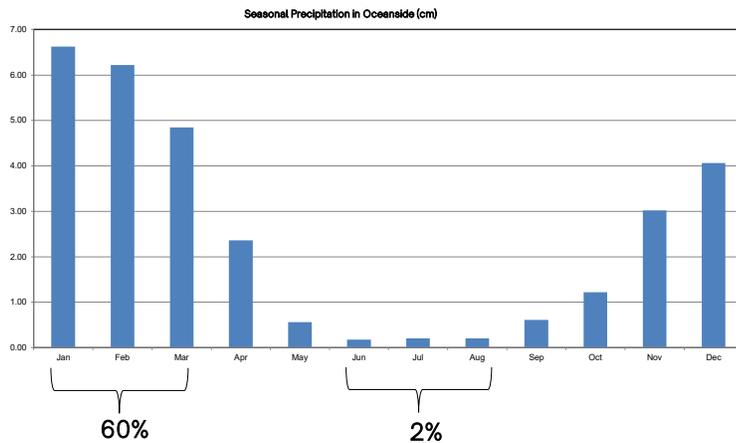
Water is still relatively inexpensive and reliable

- Typical residential water budget is **50% to 60%** outside uses
- Typical landscaping requires **50 inches** of irrigation
- Over-irrigation frequently leads to
  - Slope instability
  - Settlement
  - Mold growth
  - Seepage through foundations
  - Undermining of roads & utilities



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## Climatic Influence - Seasonal



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## “The Fatal Conceit”

(coined by Friedrich Hayek)

- To summarize - the belief that people can manipulate and control complex systems that they don't understand and have good outcomes. Invariably, when they do that, they not only do not have good outcomes, they get all kinds of unintended consequences.
- Complex systems, by definition, are systems that no one of us can fully understand. Each of us sees only a part of it, and yet when we manipulate it, we continue to be surprised by the results.

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Questions?