Characterization of stormwater debris model parameters in southern California's dense urbanized watersheds

Kian Bagheri, Joint Doctoral Student[1,2]
Hasan Davani, Assistant Professor[1]

1: San Diego State University College of Engineering

2: UC San Diego Jacobs School of Engineering

Catch Basin Insert for Trash Removal,
Courtesy of
http://unitedstormwater.com/images/installed_drainpac.jpg

Ballona Creek Trash Boom
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Data Input for PCSWMM	Source
Digital Elevation Models	USGS Earth Explorer
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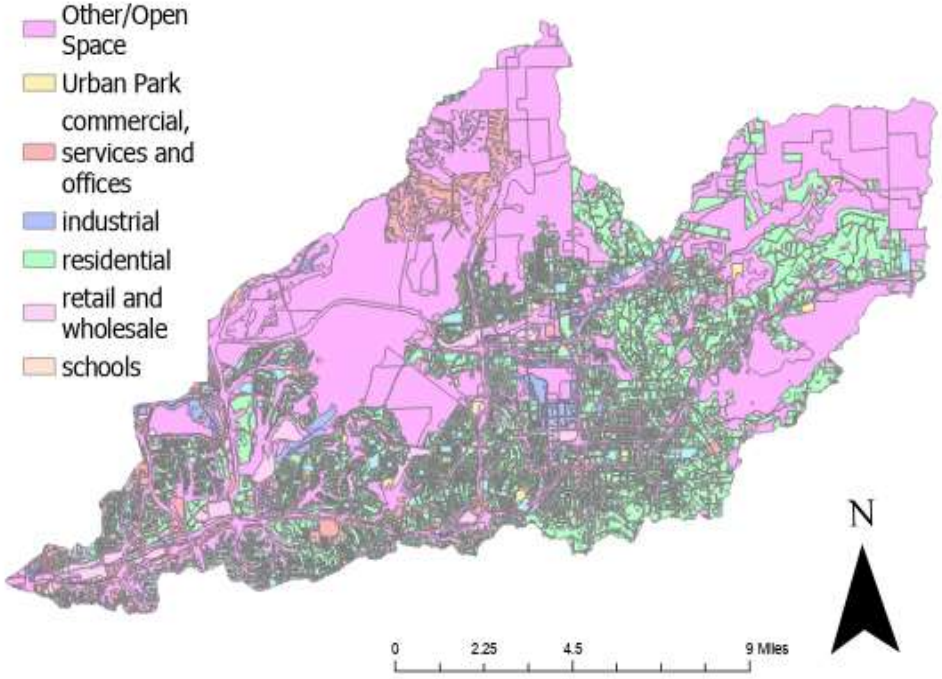
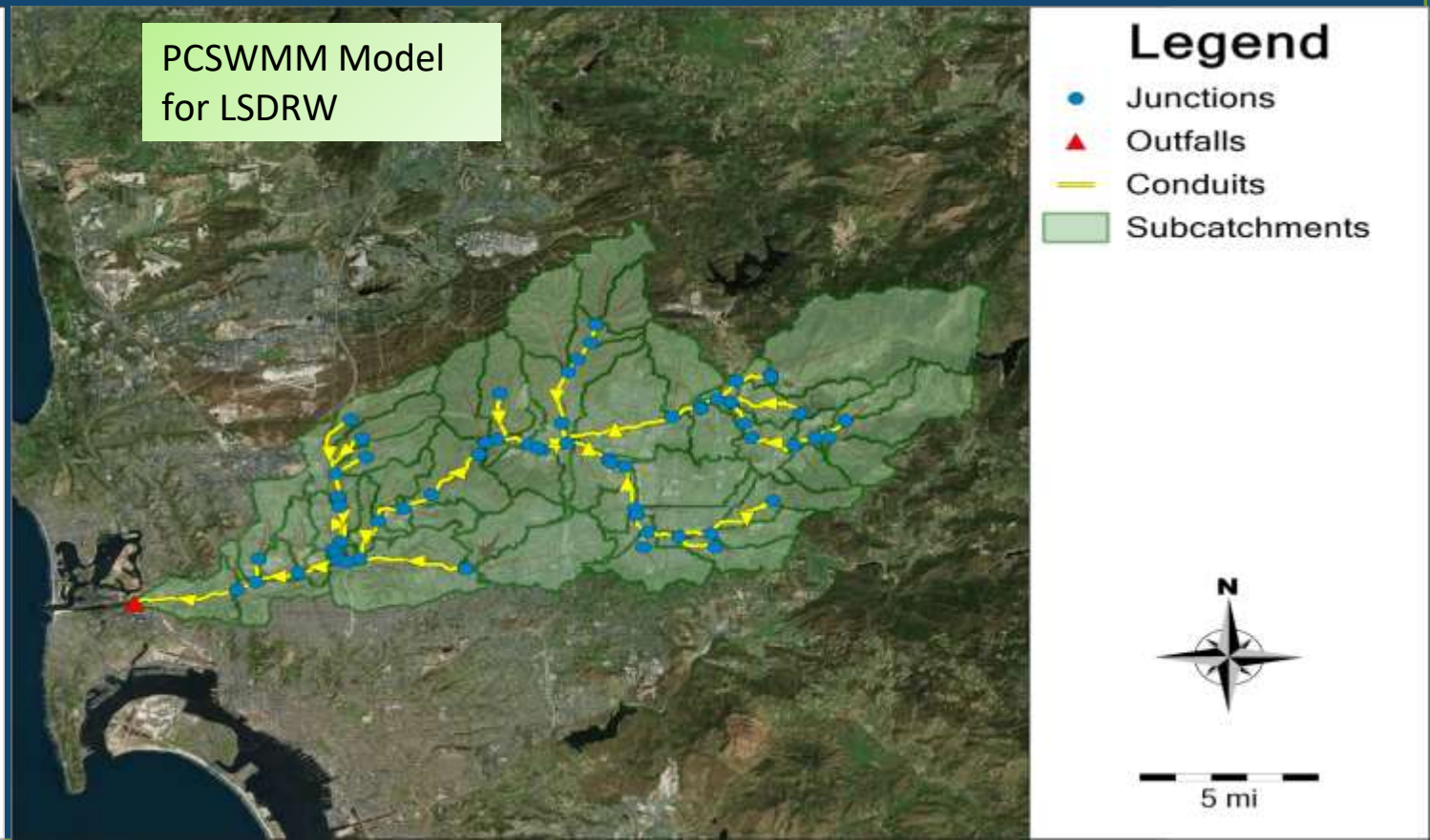
Land Use Data	San Diego Association of Governments (SANDAG) /County of Los Angeles Enterprise GIS

- Use PCSWMM, a stormwater management model, to estimate pollutant transport (litter transport) loads through the urban environment into our waterways

Land Use for Lower San Diego River Watershed (LSDRW)



PCSWMM Model for LSDRW



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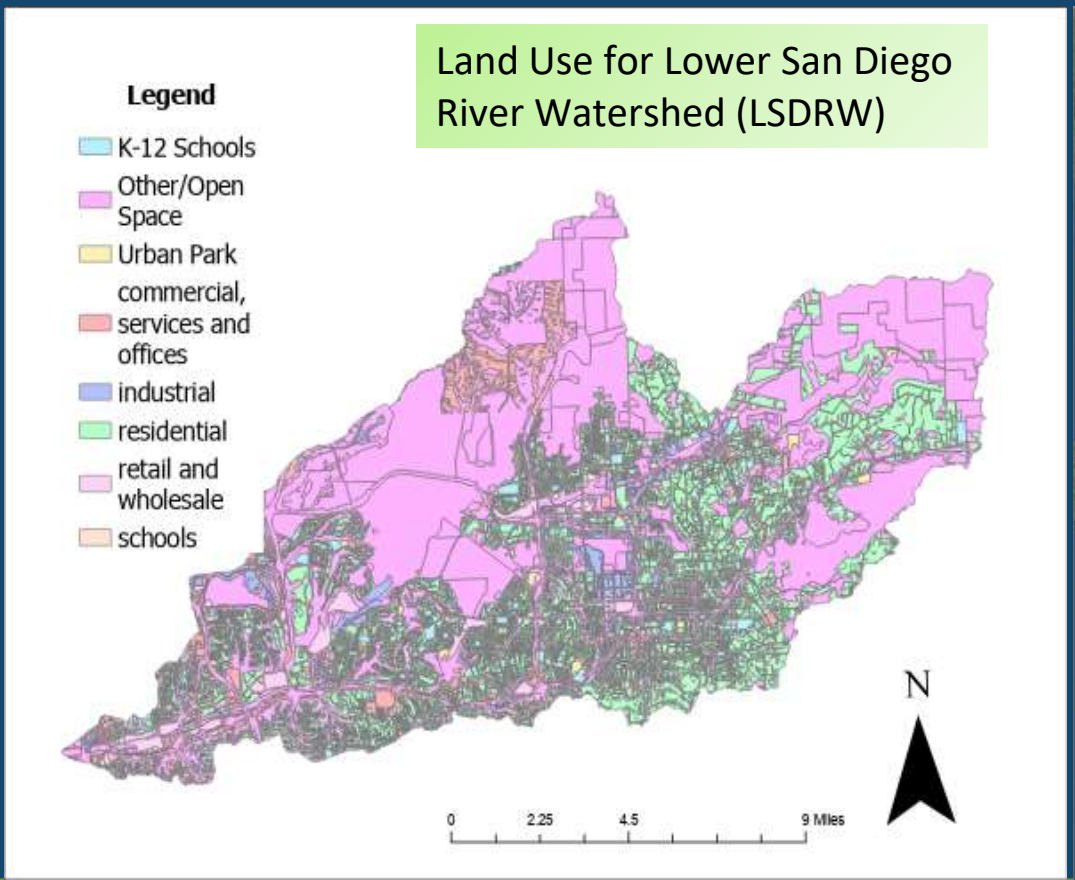

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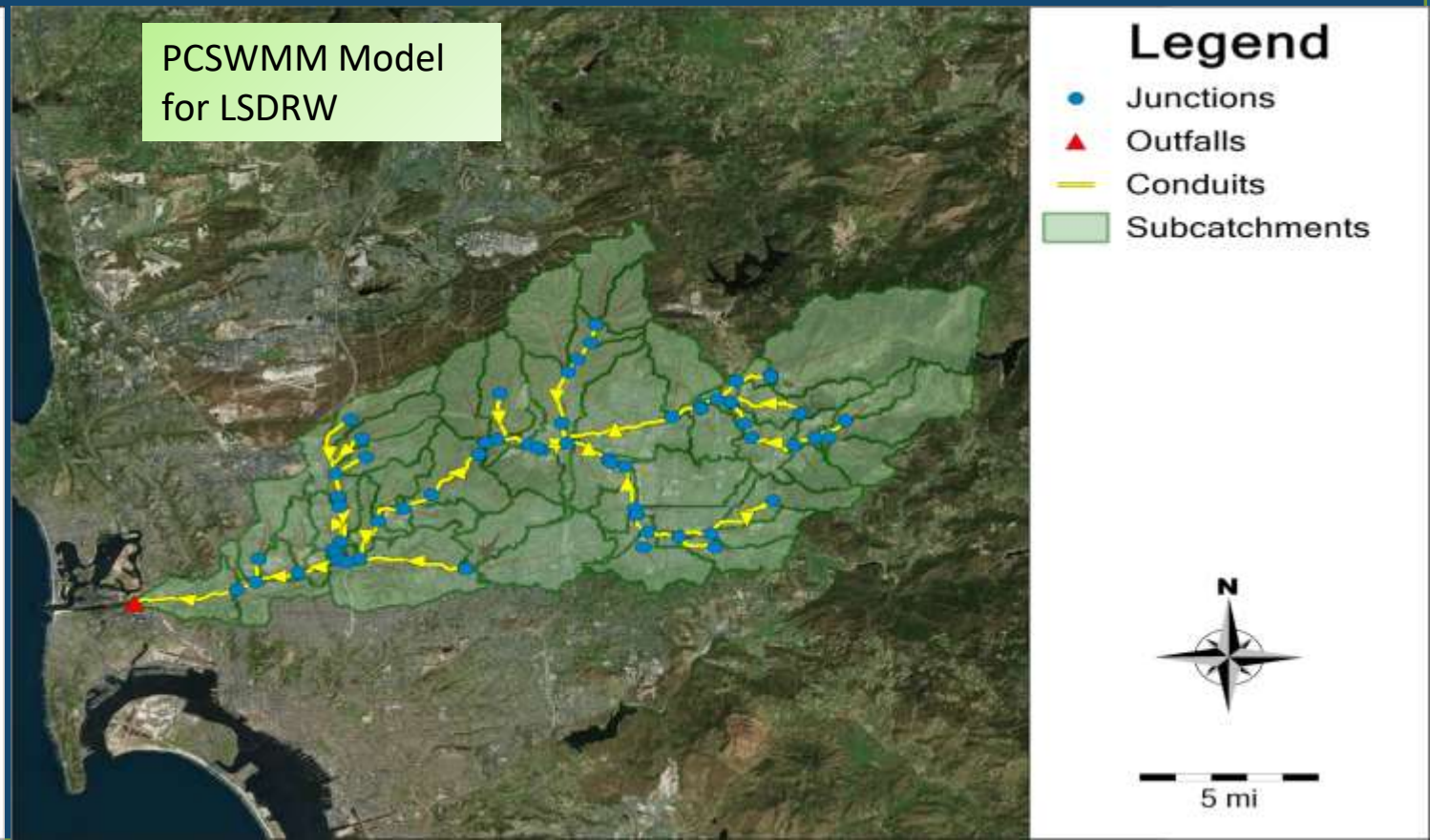

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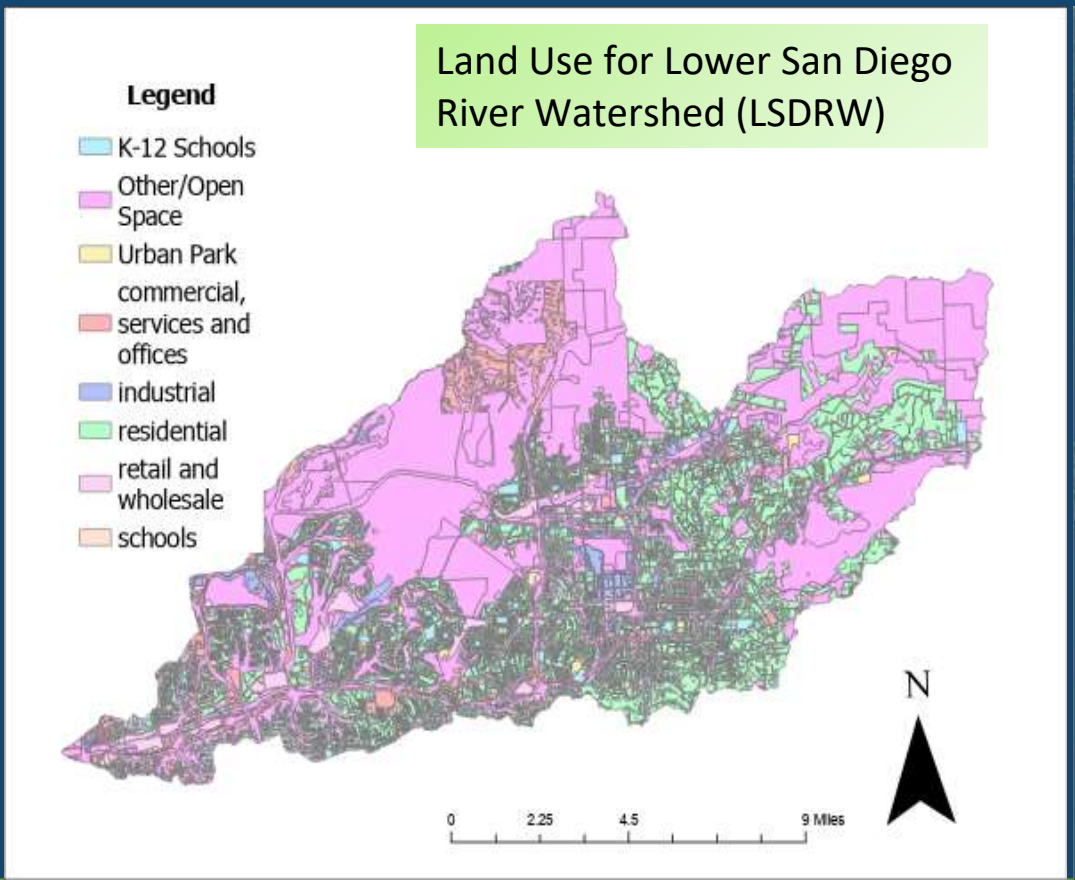

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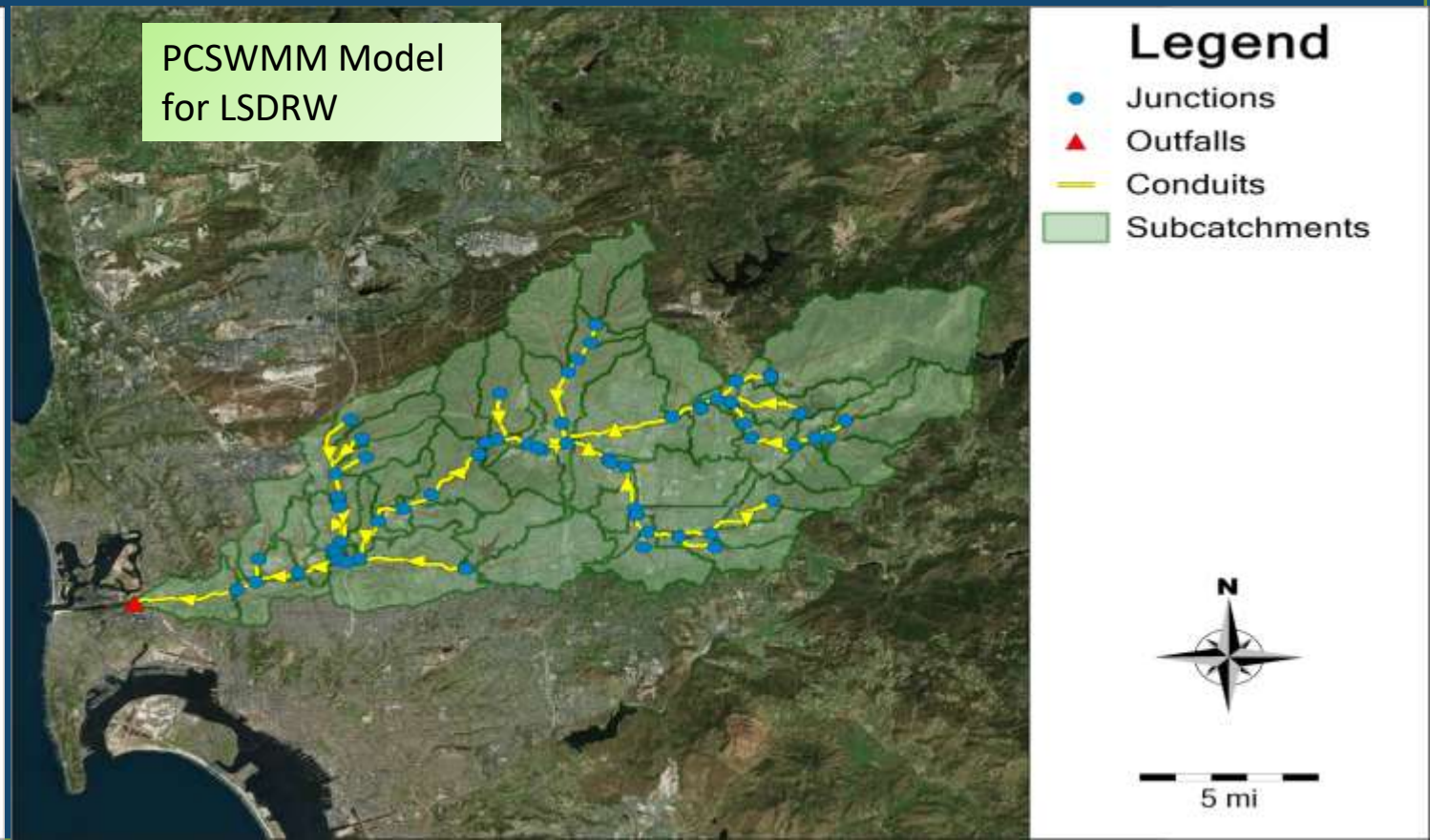

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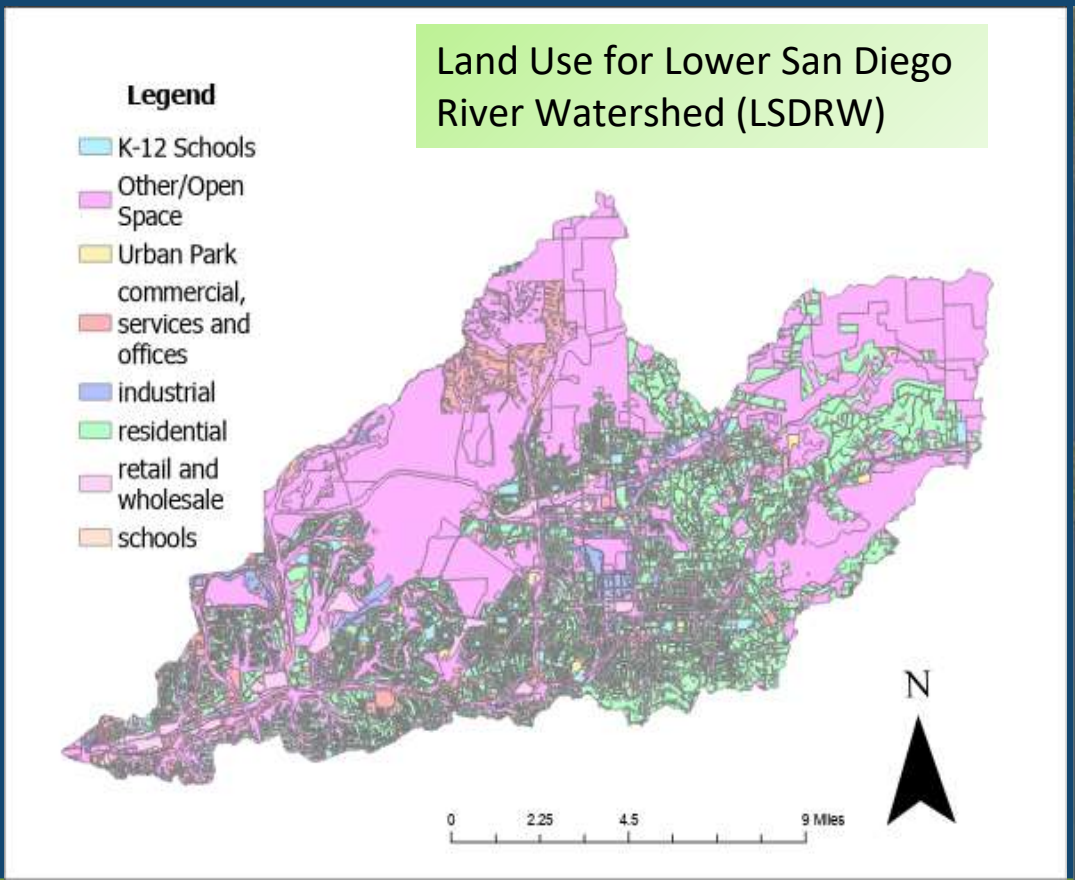

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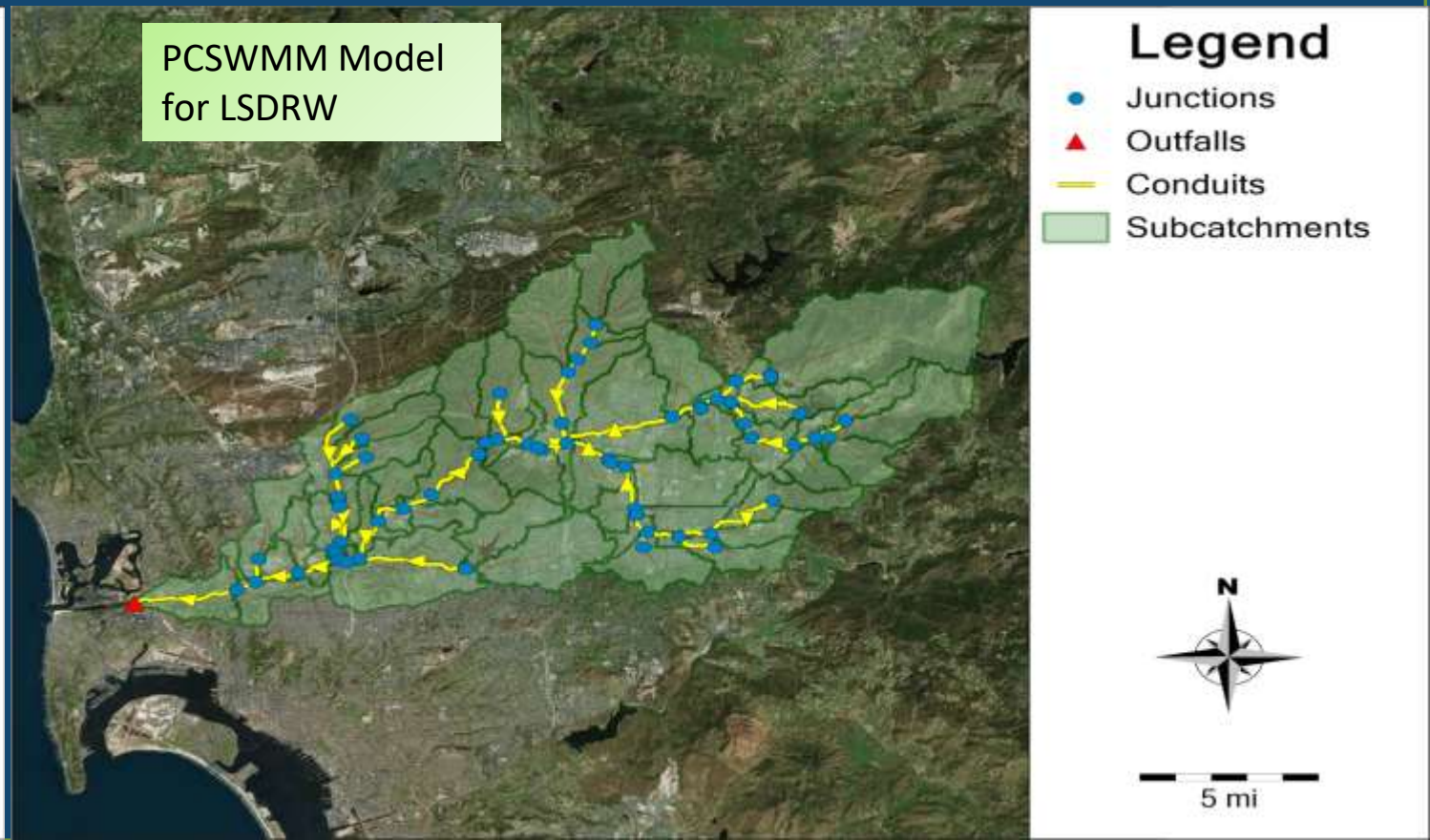

- **Total Area:** 834 sq. miles (533,760 acres)
- **Population:** ~9 million people
- **Percentage of Impervious Surfaces:** ~31 %
- **Land Use**:
  - 37% Residential
  - 8% Commercial
  - 11% Industrial
  - 44% Open Space
- **Mean Annual Rainfall:** ~21 inches

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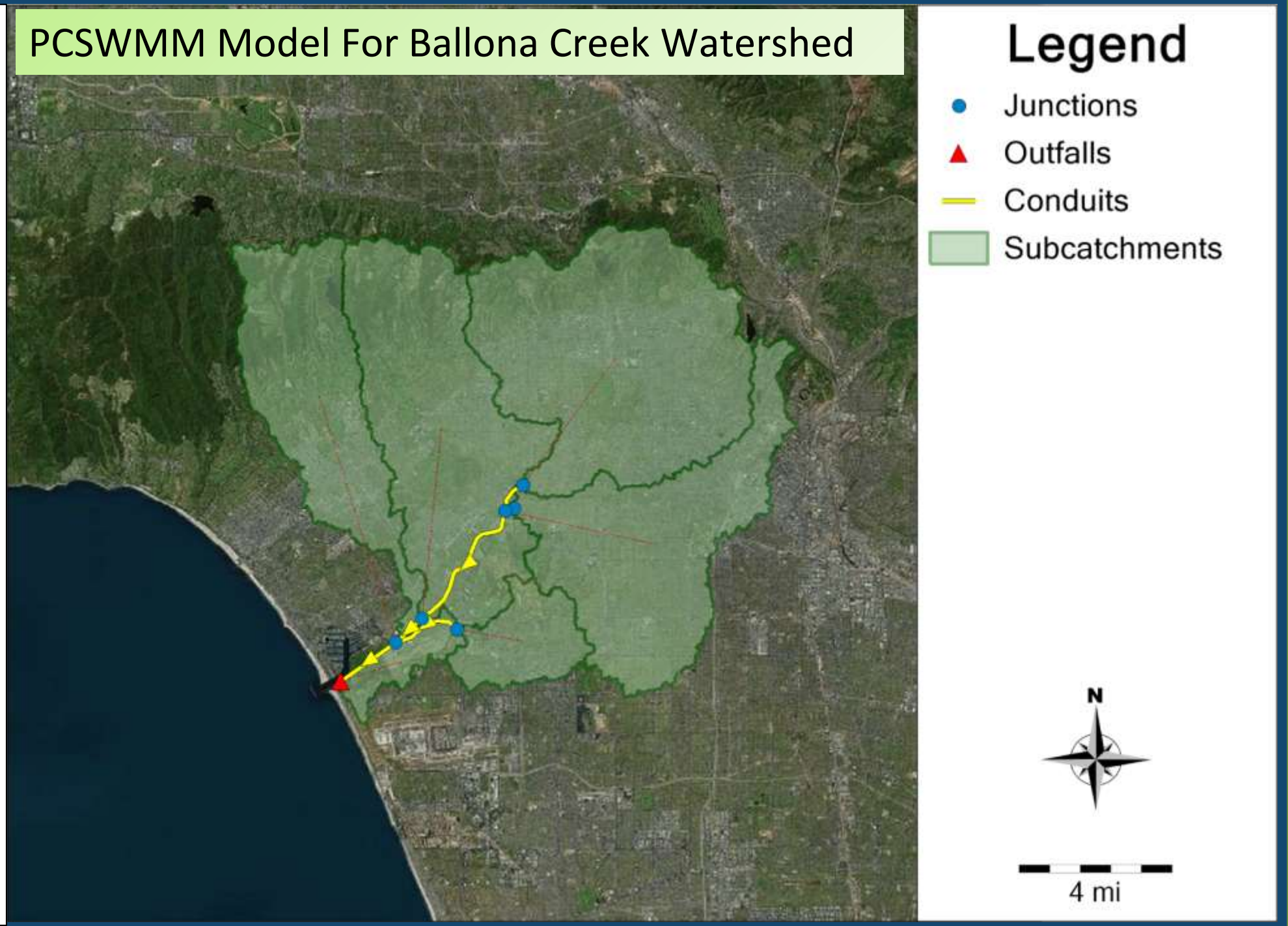
PCSWMM Model For Los Angeles River Watershed

- **Total Area:** 130 sq. miles (83,200 acres)
- **Population:** ~1.5 million people
- **Percentage of Impervious Surfaces:** ~65 %
- **Land Use**:
  - 64% Residential
  - 8% Commercial
  - 4% Industrial
  - 17% Open Space
- **Mean Annual Rainfall:** ~16.4 inches

PCSWMM Model For Ballona Creek Watershed



Buildup and Washoff Governing Equations

Parameters

A_1: is the maximum buildup possible (mass/unit area or unit curb length)

A_2: is the buildup rate constant controlling the speed of pollutant buildup (days^{-1})

A_3: is the washoff coefficient (inches^{-1})

A_4 : is the washoff exponent (unitless)

- Buildup Curves follow exponential growth until reaching a maximum buildup value
- Washoff is dependent on buildup mass available

$$Buildup = A_1*(1-exp(-A_2*t)$$

where,

Buildup = mass/ unit area (or curb length)
t = number of preceding dry weather days

$$Washoff = A_3*Runoff^{A_4}*Buildup$$

where,

Washoff = load in mass/hr
Runoff = inches/hr
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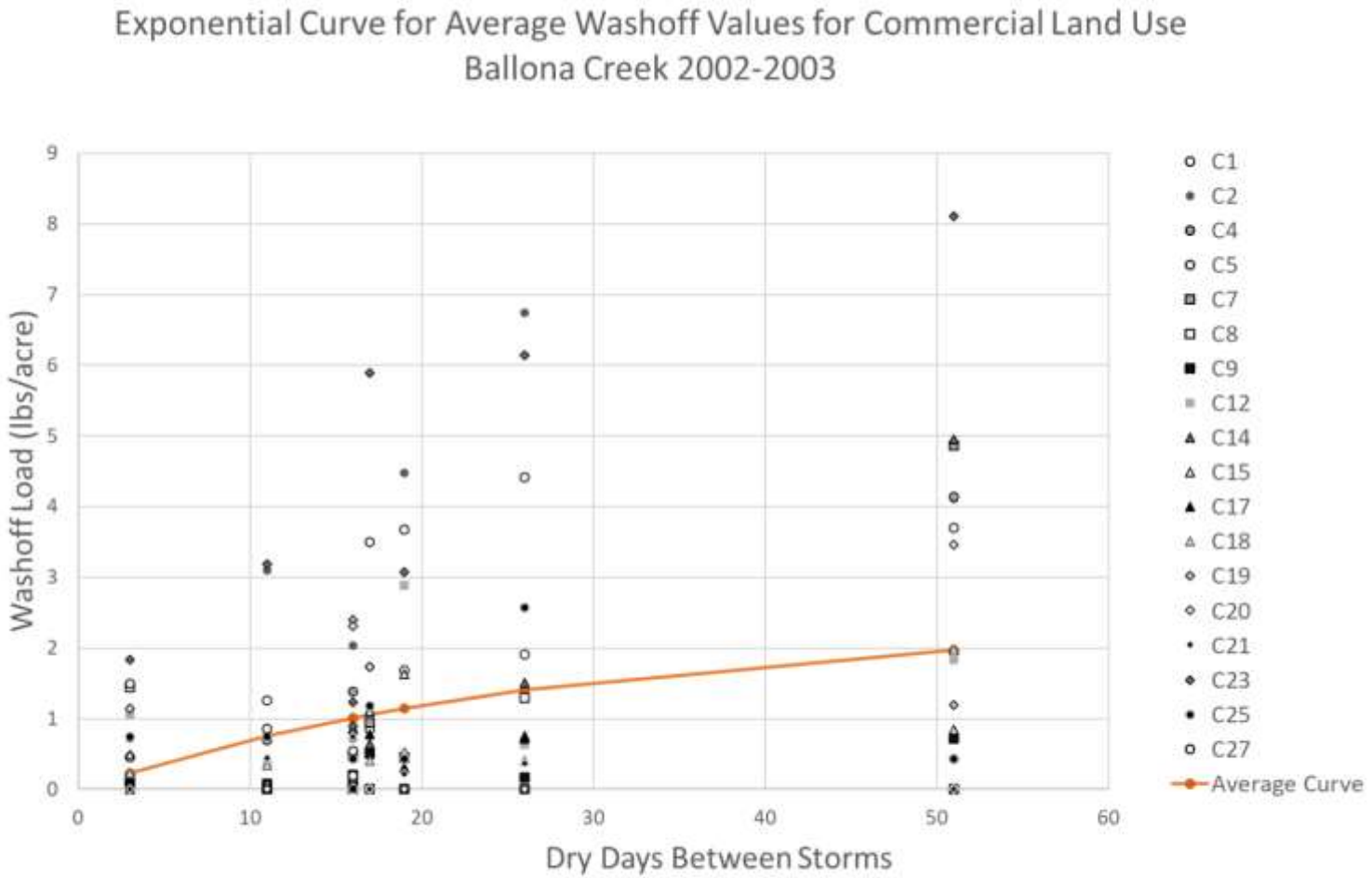
TRASH FROM BALLONA CREEK YEAR 2002-2003



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- Spanning 5 Land Uses: **Commercial, Industrial, High Density Single Family Residential, Low Density Single Family Residential, and Open Space**
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- **C1-C27 Site ID for Commercial land use trash collection sites**

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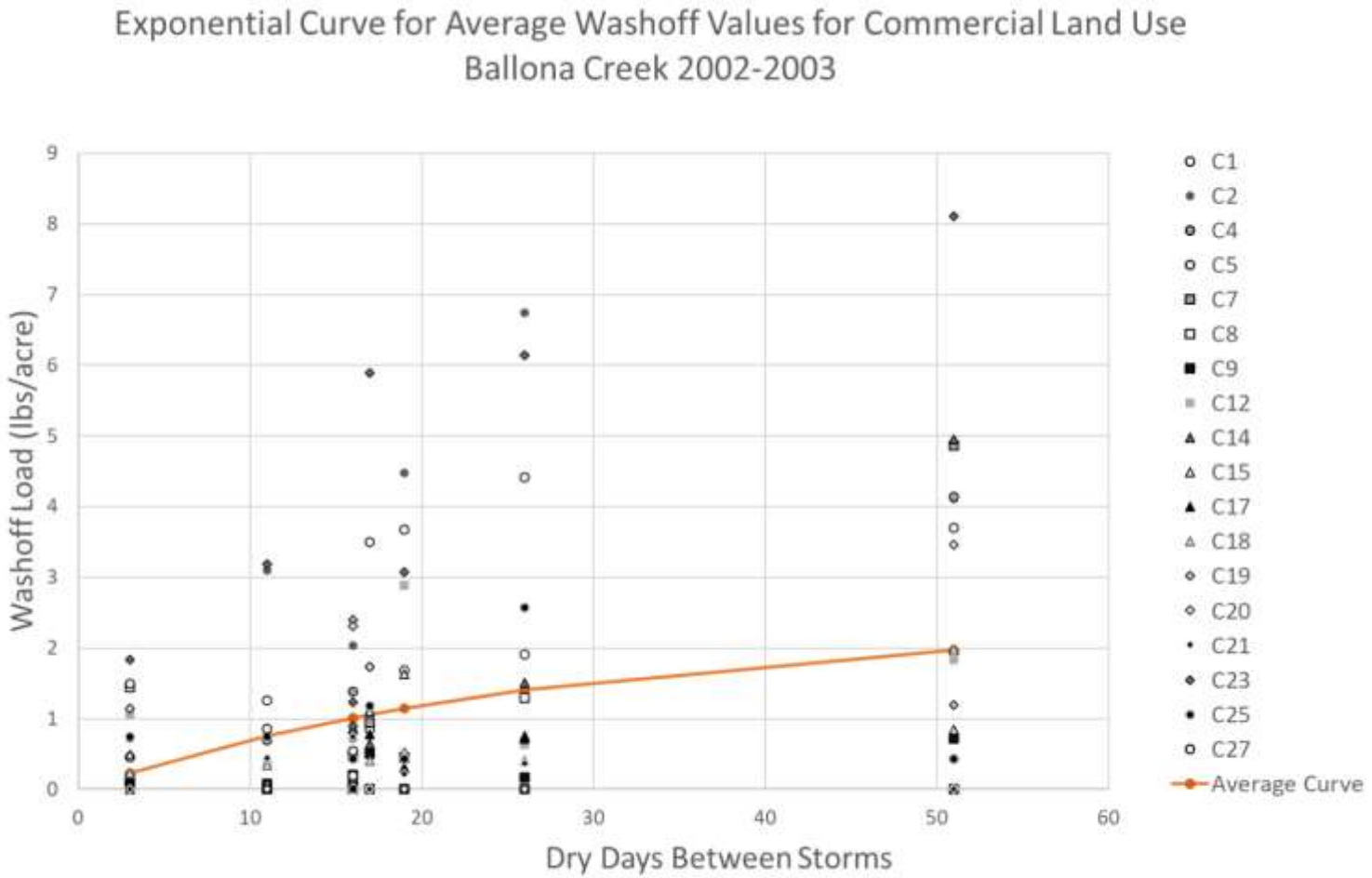

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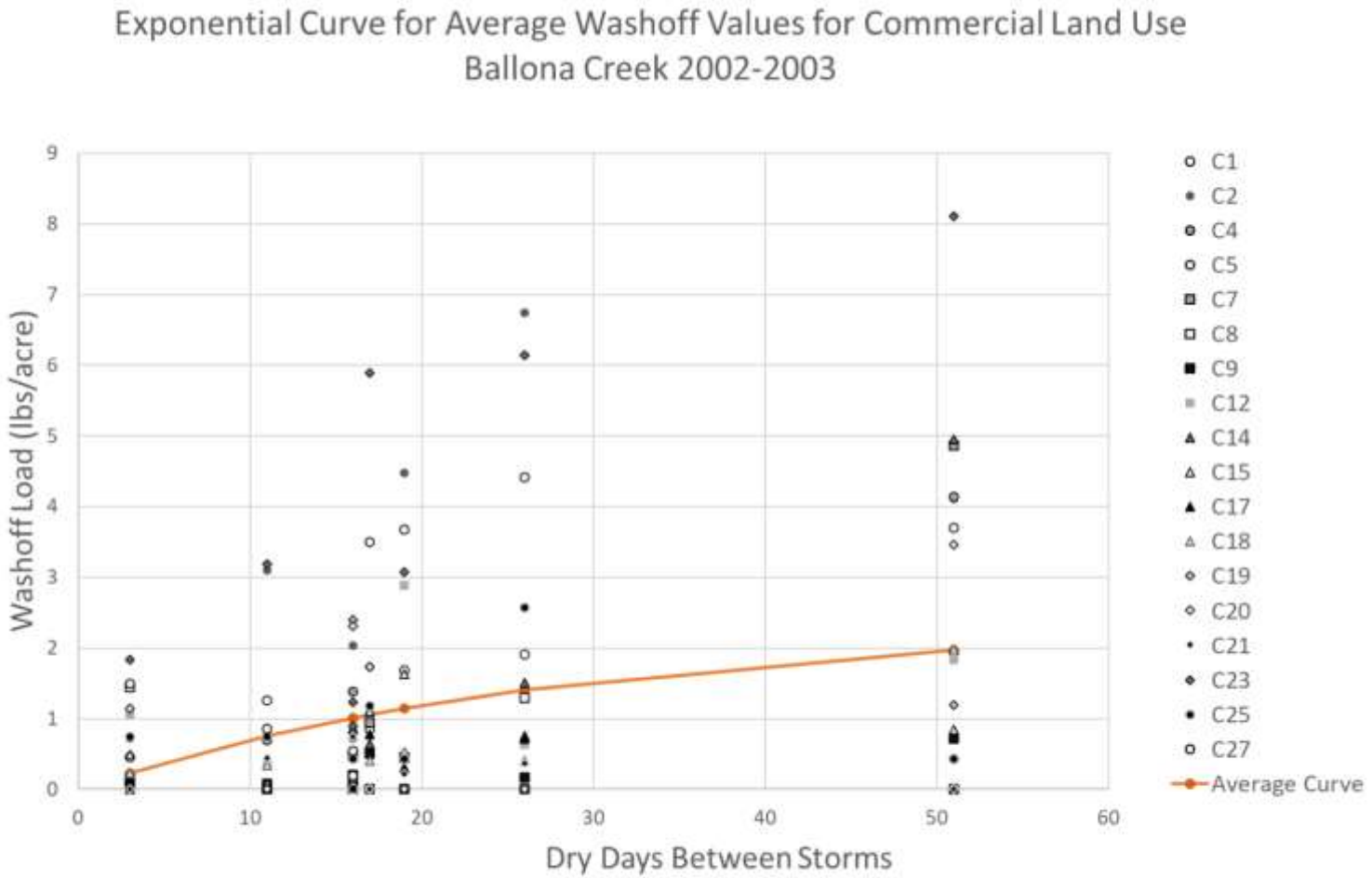

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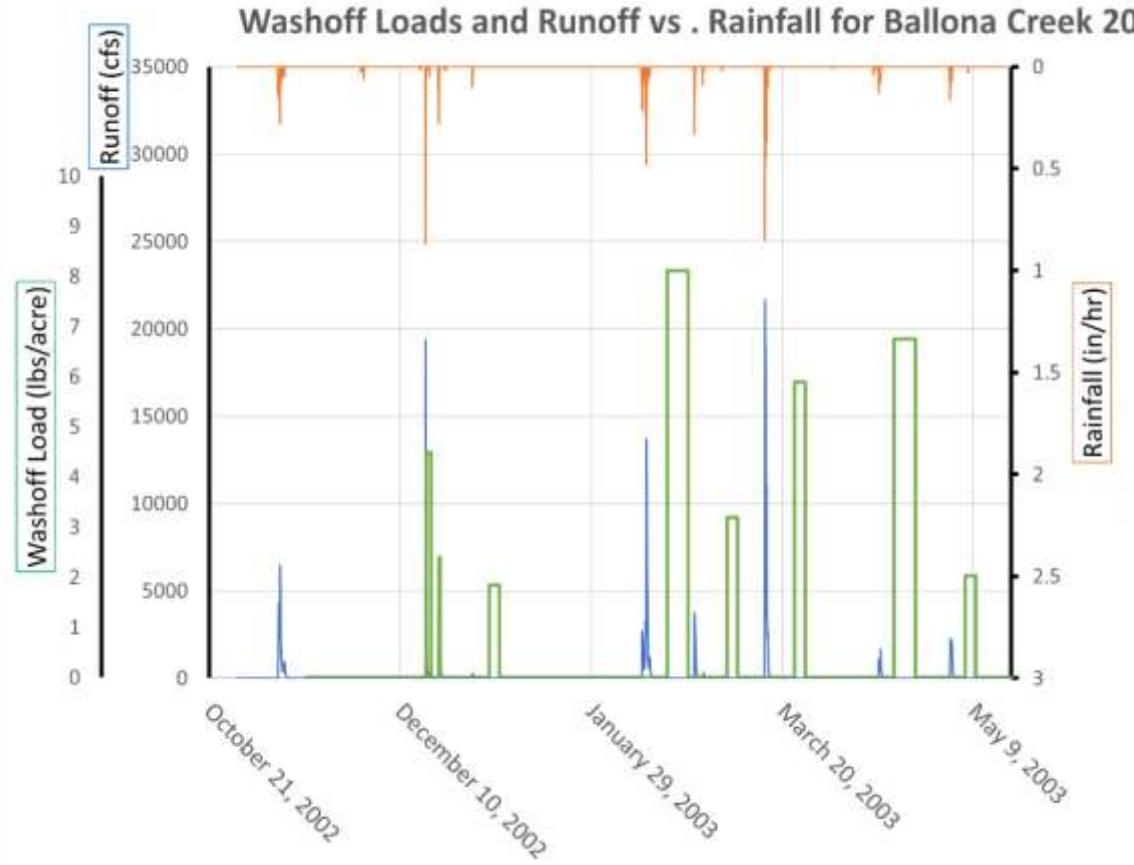

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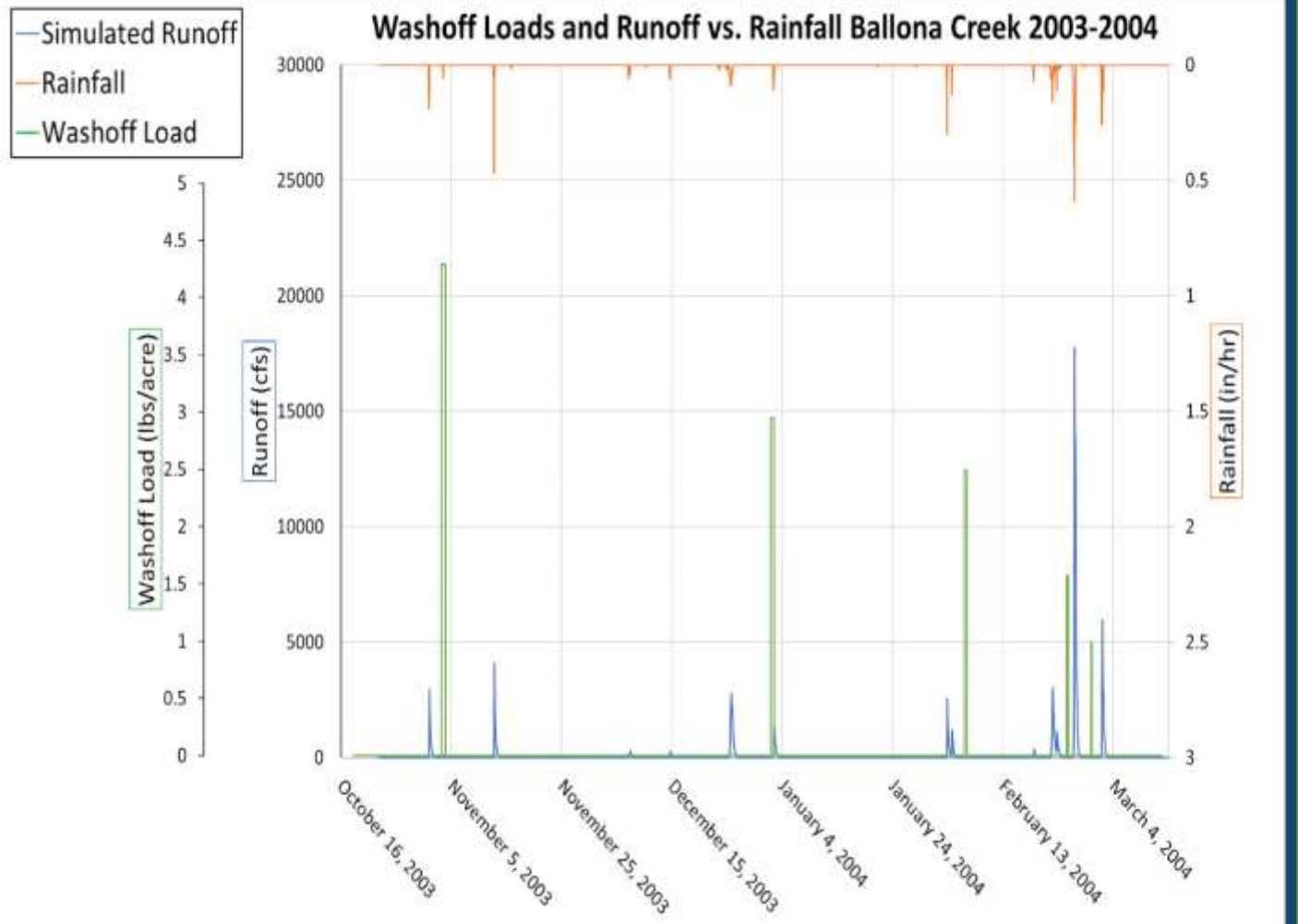

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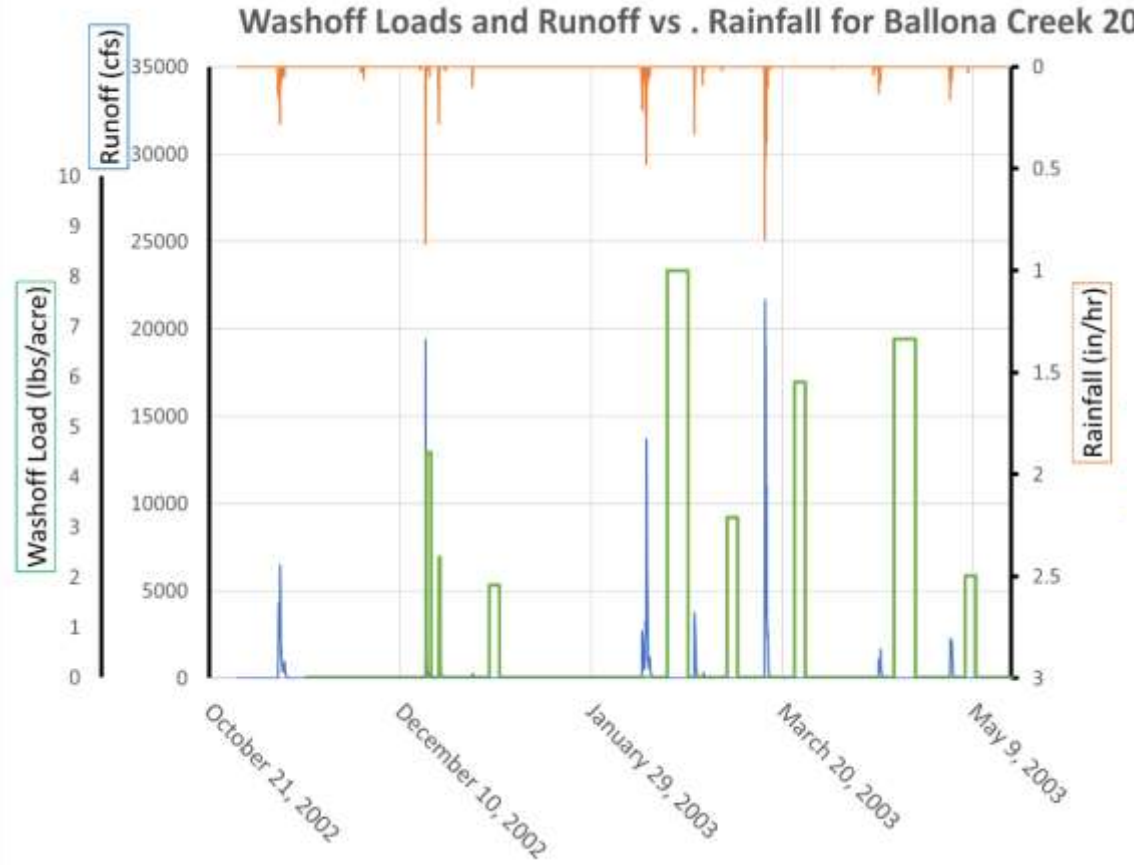

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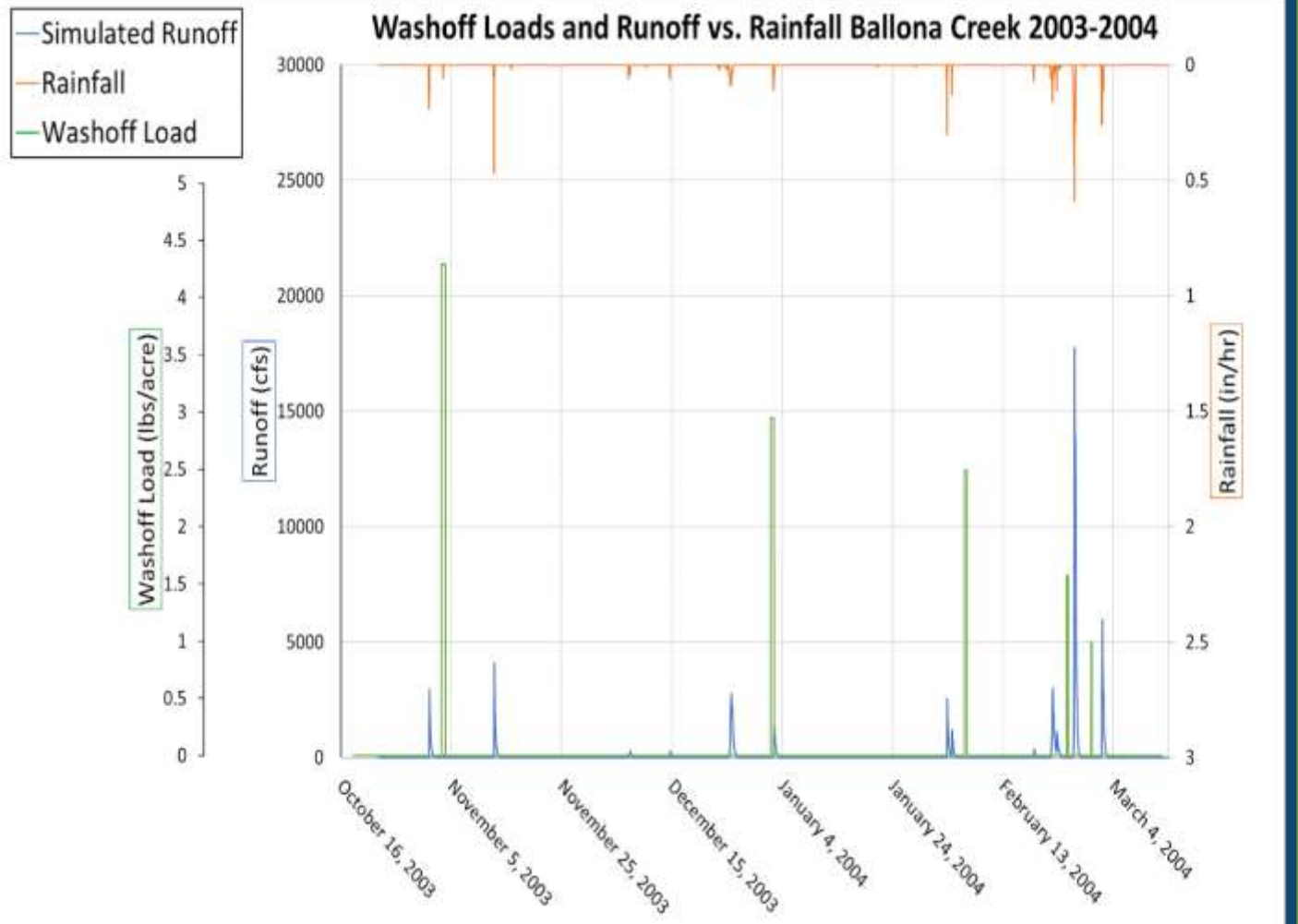

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Watershed	Total loading based on **PCSWMM** simulation (lbs.)	Year
Ballona Creek	93,184	2002-2003
Los Angeles River	3,341,337	2002-2003
Ballona Creek	62,732	2003-2004
Los Angeles River	2,038,963	2003-2004

Thank you!

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Future Work

- Sensitivity Analysis for Buildup and Washoff Parameters
- Application of Parameters toward Lower San Diego River Watershed

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