

# UPDATING THE SAN DIEGO IRWM TO ADDRESS INTEGRATED FLOOD MANAGEMENT

## WORKSHOP NO. 2



**SAN DIEGO**  
Integrated Regional  
Water Management

The logo for the San Diego Integrated Regional Water Management (IRWM) program. It features a stylized graphic of three wavy lines in blue and green, representing water, positioned to the left of the text. The text "SAN DIEGO" is in a bold, green, sans-serif font, while "Integrated Regional Water Management" is in a blue, sans-serif font with a white outline.

PRESENTED BY:  
BRUCE M. PHILLIPS, MS, PE  
DECEMBER 4, 2012

# Presentation Program Outline

Calif. SFMP Project Data

Additional Flood Risk Data

Watershed Flood Risk Exposure

General IFM Strategies at Different Scales

IFM Watershed Planning Database

IFM GIS Watershed Planning Tool

# Flood Management - Workshop

## Objectives

### Today's Workshop

- Develop general concepts for IFM strategies
- Locations of flood risk and exposures
- IFM watershed planning tools
- Characterize flood problems/sources in watershed and Cities

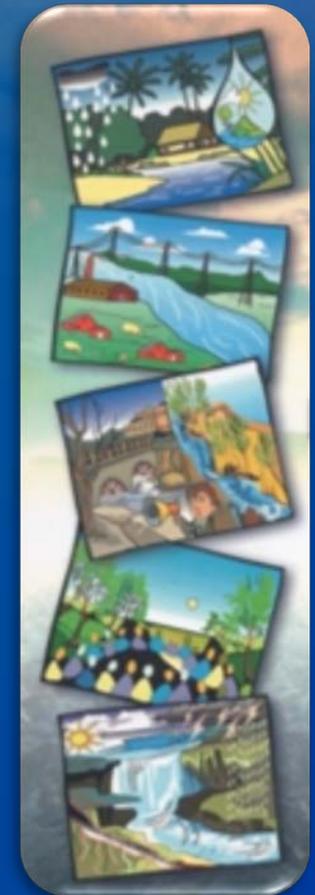
### Future Workshop

- Draft Planning Guidance Document
  - Guiding IFM planning principles
  - Watershed goals and objectives
  - IFM Planning Strategies

# Review – Definition of Integrated Flood Management (IFM)

## Holistic approach for dealing with flood risks:

- Interconnection flood management actions within water resources management and land use planning
- Value of coordinating across geographic and agency boundaries
- Need to evaluate opportunities and impacts from a “system” perspective
- Importance of environmental stewardship and sustainability



# Community Flood Damage Loss Background

- **Direct Physical Damage**
  - General building stock
  - High potential loss facilities
  - Transportation systems
  - Utility systems
  - Natural resource
- **Induced Physical Damage**
  - Fire following
  - Hazardous materials release
  - Debris Generation



# Community Flood Damage Loss Background

- **Direct Economic/Social Losses**

- Building replacement costs
- Income loss
- Crop damage
- Casualties
- Shelter needs

- **Induced Physical Damage**

- Production
- Income
- Employment
- Impacts with/without aid

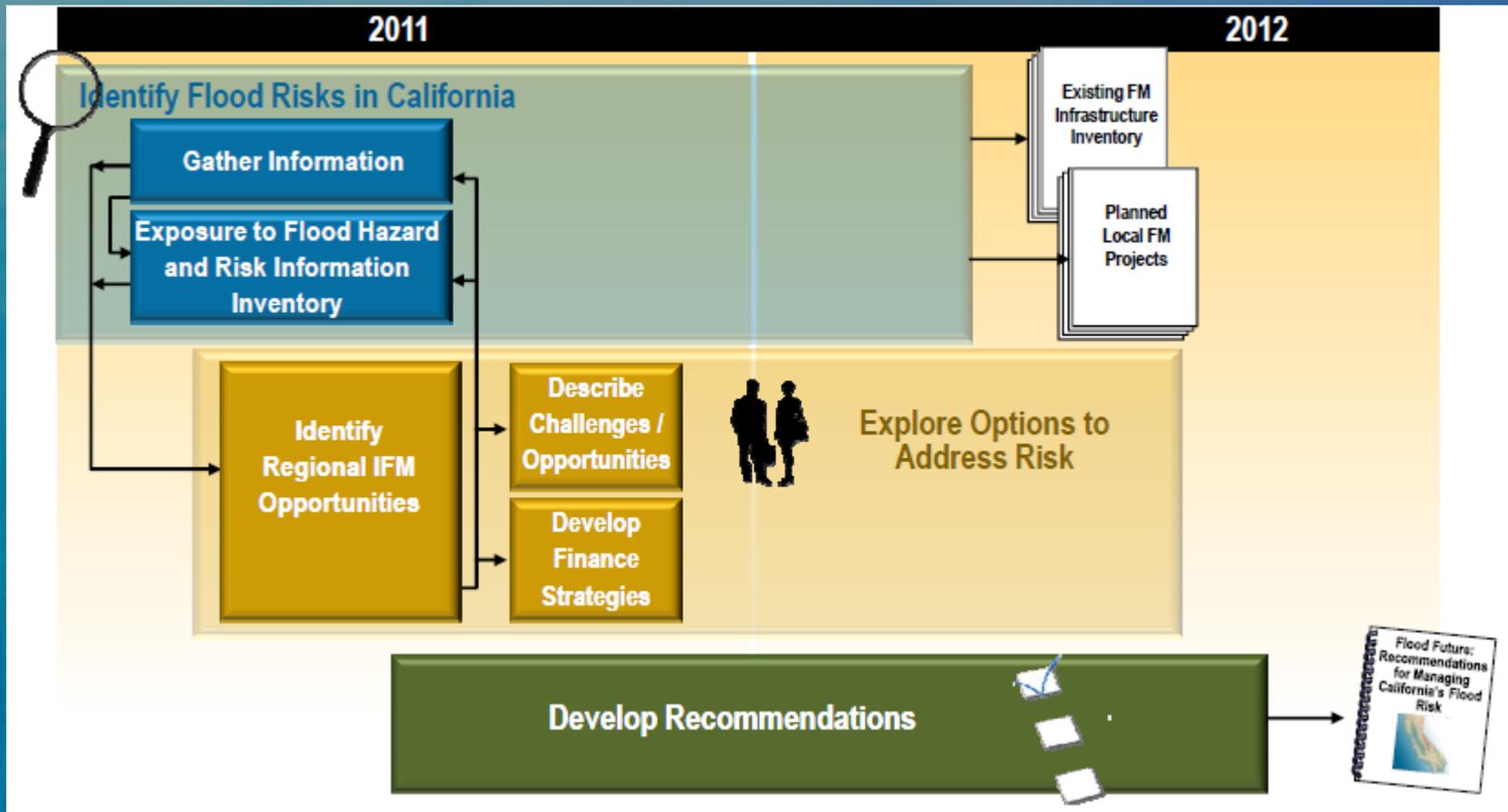




# Statewide Floodplain Management Planning - SFMP Data



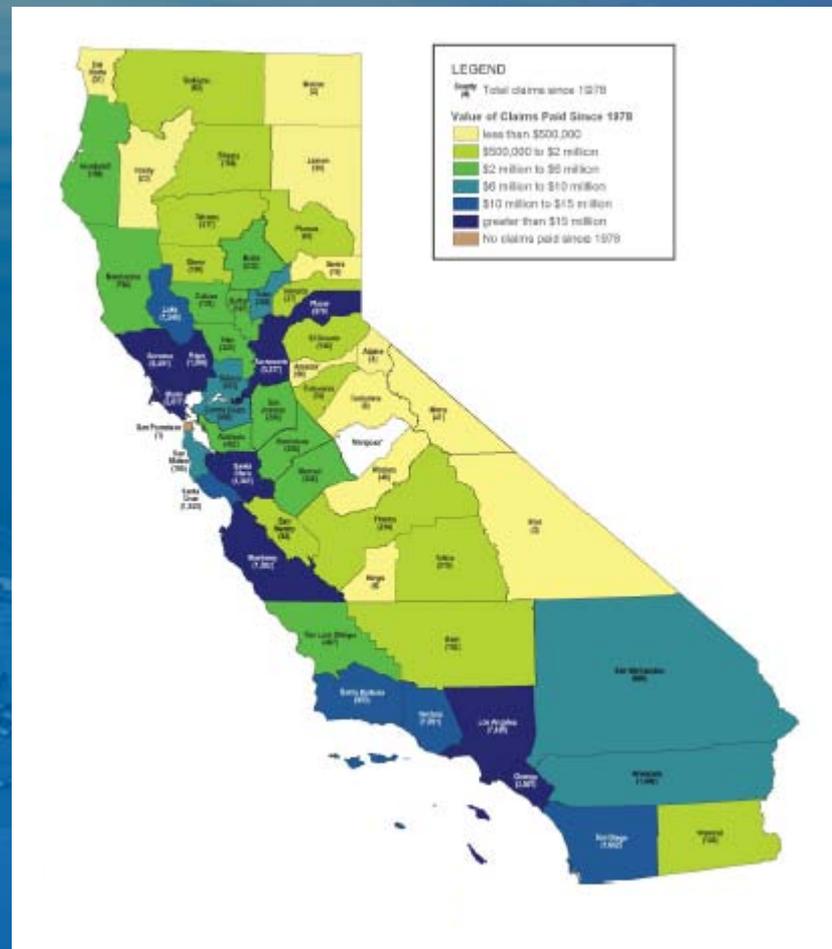
# Statewide Floodplain Management Planning Study



# Information Gathering Findings



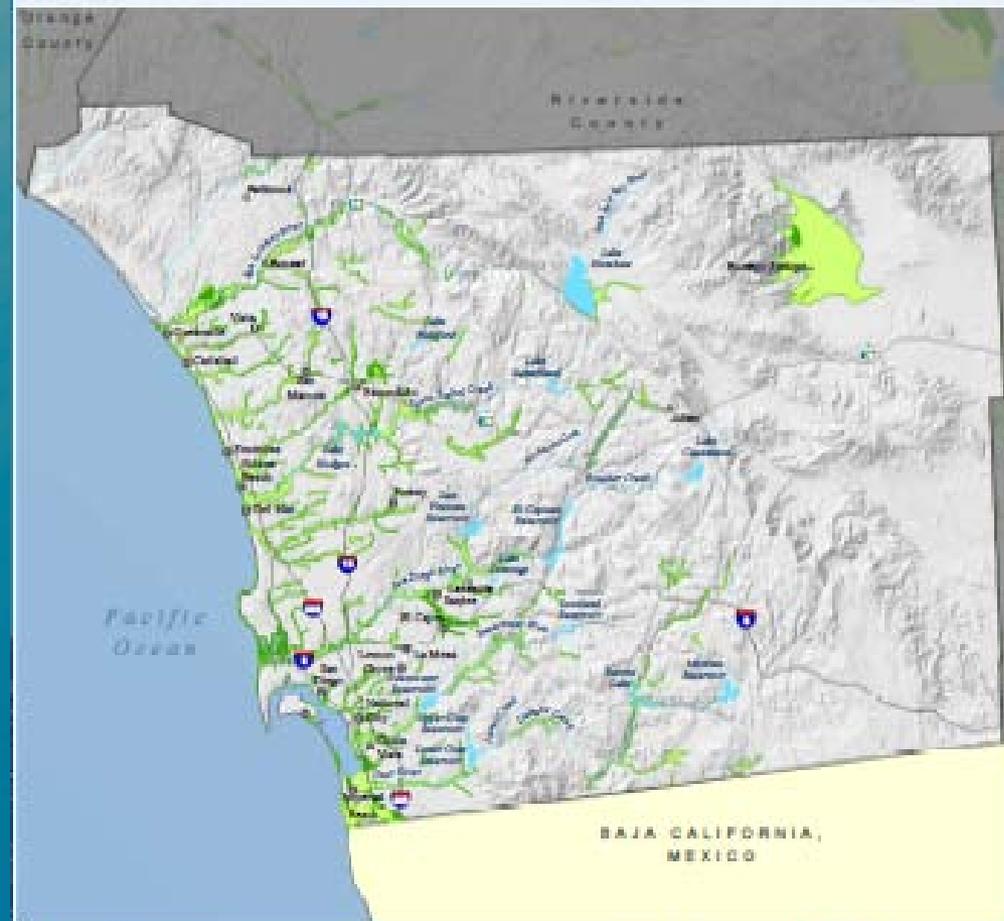
Data Availability



FEMA \$\$ Flood Claims

# Existing Floodplain Mapping / Exposure – work product

100-year and 500-year Floodplains



## Flood Hazard Exposure

### County Statistics

Total Areaage	2.7 million
Total Population	2.8 million
Total Structures	821,400
Total Value of Structures and Contents	\$202.8 billion
Total Agricultural Areaage	80,400
Total Value of Agricultural Land	\$28.3 billion

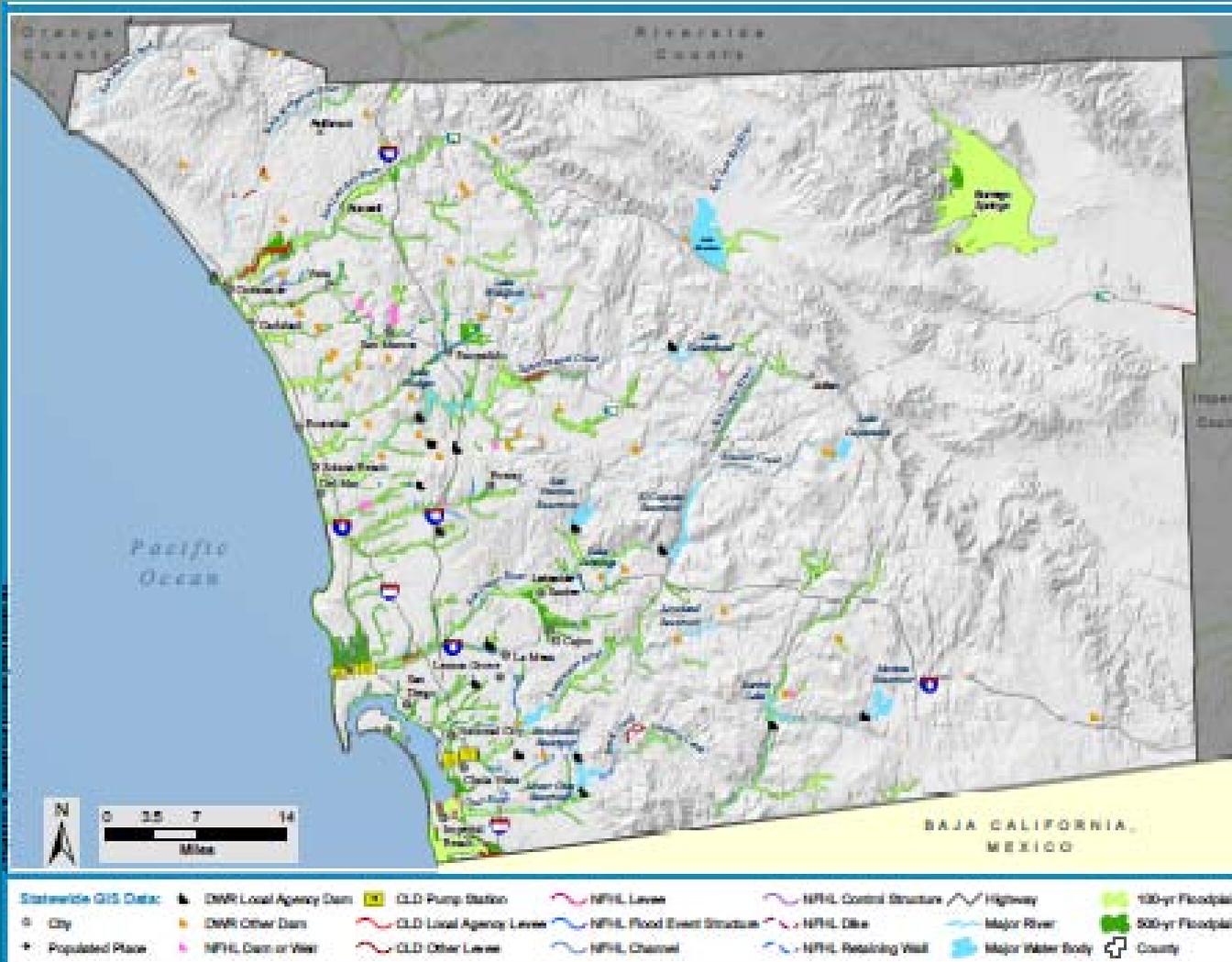
### Summary of Exposure to Flood Hazard Reported by County

	100-yr Event	500-yr Event
Exposed Area (acres)	64,000	26,000
Percent of Area Exposed	2%	1%
Population Exposed	75,700	162,400
Percent of Population Exposed	3%	6%
Exposed Structures	20,000	80,000
Value of Exposed Structures and Contents	\$4.3 billion	\$17.0 billion
Exposed Agricultural Land (acres)	7,000	4,400
Value of Exposed Agricultural Land	\$21.8 million	\$28.7 million
Department of Defense Facilities	0	0
Essential Facilities	48	18
High-Potential Loss Facilities	23	40
Lifeline Utilities	0	10
Transportation Facilities	221	210
Transportation Regiments (inlets)	38	140
Native American Tribal Land (acres)	140	140
Total Sensitive Plant Species Exposed	100	100
Total Sensitive Animal Species Exposed	60	60

San Diego County



# Inventory of Flood Infrastructure Data – work product



## Issues:

- Limited primarily to available GIS data
- Regional scale
- Did not identify location of problems or deficiencies

# Survey Results – Types of IFM Projects Implemented Statewide

## Multi-purpose flood management:

- Ecosystem restoration
- Water supply
- Habitat restoration/fish passage
- Groundwater recharge
- Recreation
- Water quality
- Erosion/sediment control

# Factors Related to Success Implementing IFM project

## Factors for Success

- Integrated funding multiple sources
- Plan in-place
- Support of stakeholders
- Leveraging partnership with agencies

## Obstacles/Barriers:

- Limited funding
- Increased permitting/regulatory requirements
- Additional costs for project maintenance

# Numbers and Types of IFM Projects

Management Strategy Integrated with Flood Management	Number of IFM Projects
Ecosystem Restoration	244
Water Supply / Groundwater Recharge	122
Water Quality	91
Recreation	56
Hydropower	4



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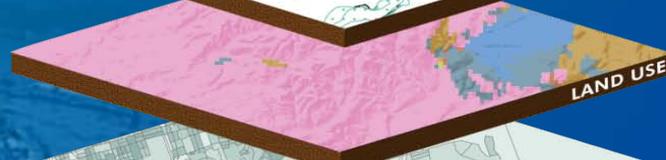
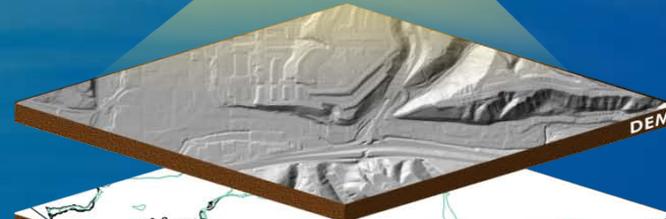
# County HAZ-US Flood Hazard Assessment



# San Diego County Multi-Jurisdictional Hazard Mitigation (2004)



# GIS Application to Evaluate Hazards at Regional Planning



FIT

ASSETS

**"WHAT IF"**

**SOLUTIONS**



# Defining Flood Exposure and Risk

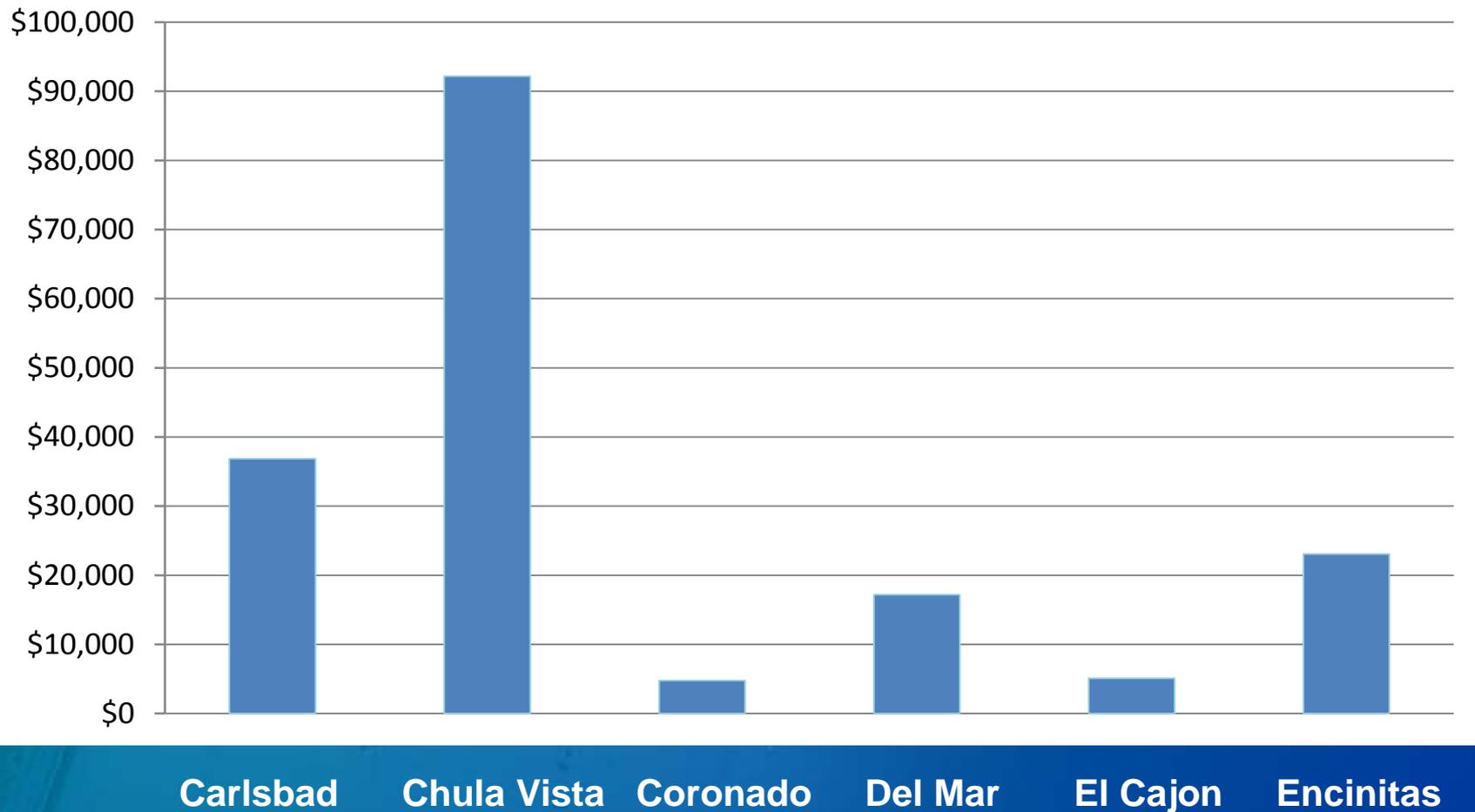
- Flood Risk - likelihood of consequence from inundation
- Flood Exposure – relationship between the flood hazard on the effect on loss of property, life, and environmental resources



# Flood Exposure Estimates to Critical Uses

Jurisdiction	Data	AIR	BRDG	BUS	COM	ELEC	EMER	GOVT	HOSP	INFR	PORT	POT	RAIL	SCH	Total
Carlsbad	Number	0	6	0	5	0	0	0	0	6	0	0	0	0	17
	Exposure (x\$1000)	0	13,065	0	21,838	0	0	0	0	1,933	0	0	0	0	36,836
Chula Vista	Number	0	16	0	0	0	0	1	0	9	0	0	0	0	26
	Exposure (x\$1000)	0	68,811	0	0	0	0	2,000	0	21,357	0	0	0	0	92,168
Coronado	Number	0	0	0	0	0	0	1	0	3	0	0	0	0	4
	Exposure (x\$1000)	0	0	0	0	0	0	2,000	0	2,777	0	0	0	0	4,777
Del Mar	Number	0	0	0	0	3	0	0	0	5	0	0	0	0	8
	Exposure (x\$1000)	0	0	0	0	13,644	0	0	0	3,526	0	0	0	0	17,170
El Cajon	Number	0	1	0	0	0	0	0	0	0	0	0	0	3	4
	Exposure (x\$1000)	0	2,083	0	0	0	0	0	0	0	0	0	0	3,000	5,083
Encinitas	Number	0	4	0	3	0	1	0	0	5	0	0	0	0	13
	Exposure (x\$1000)	0	12,388	0	6,000	0	2,000	0	0	2,655	0	0	0	0	23,043
<b>Total Number</b>		<b>0</b>	<b>27</b>	<b>0</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>28</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>72</b>
<b>Total Exposure (x\$1000)</b>		<b>0</b>	<b>96,347</b>	<b>0</b>	<b>27,838</b>	<b>13,644</b>	<b>2,000</b>	<b>4,000</b>	<b>0</b>	<b>32,248</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,000</b>	<b>179,077</b>

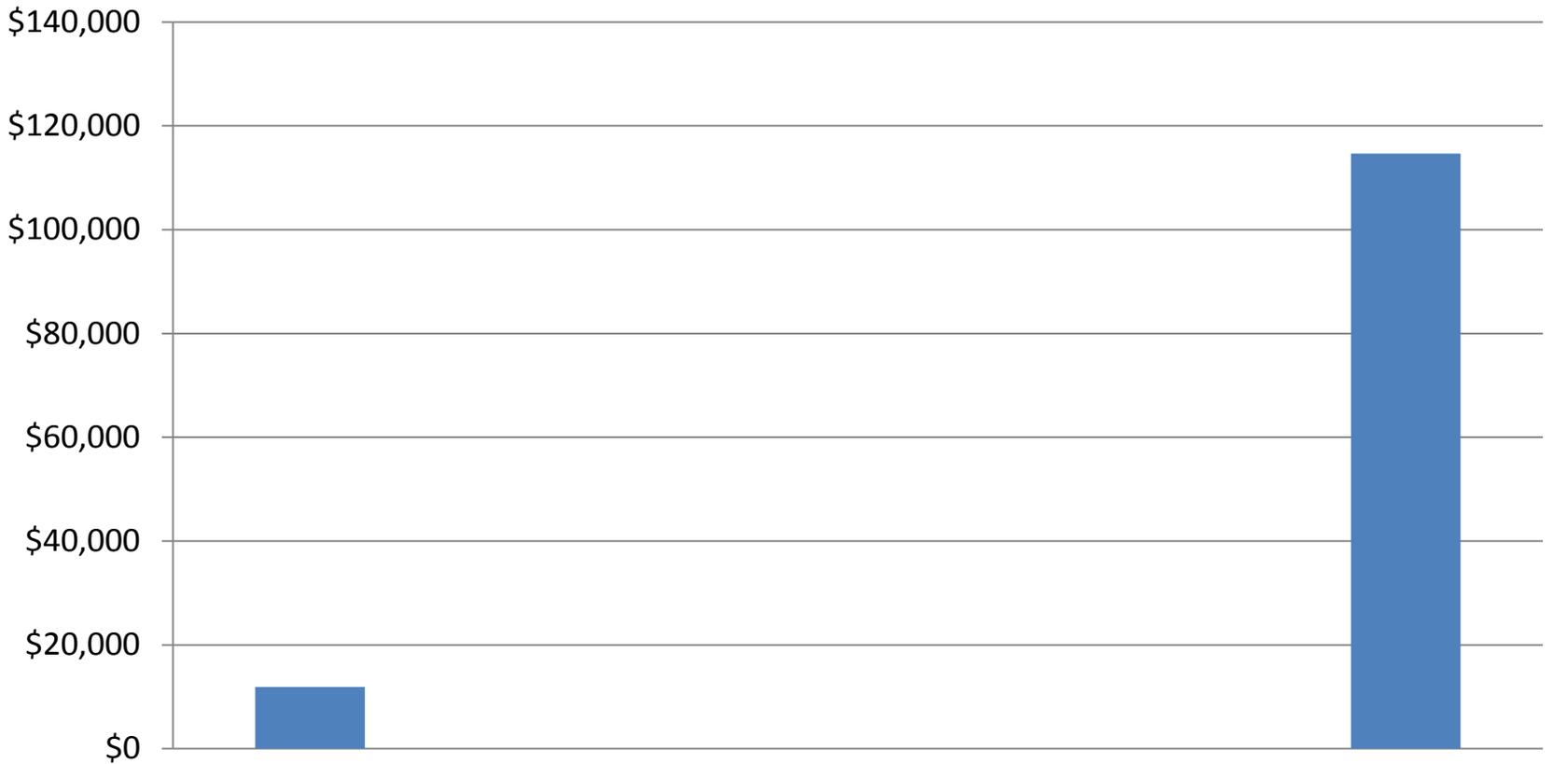
# Flood Exposure Comparison Dollar Damages



# Flood Exposure Estimates to Critical Uses

Jurisdiction	Data	AIR	BRDG	BUS	COM	ELEC	EMER	GOVT	HOSP	INFR	PORT	POT	RAIL	SCH	Total
Escondido	Number	0	1	0	0	0	1	0	0	6	0	0	0	6	14
	Exposure (x\$1000)	0	2,127	0	0	0	2,000	0	0	1,762	0	0	0	6,000	11,889
Imperial Beach	Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Exposure (x\$1000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
La Mesa	Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Exposure (x\$1000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lemon Grove	Number	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Exposure (x\$1000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
National City	Number	0	9	0	0	0	0	0	0	6	2	0	0	1	18
	Exposure (x\$1000)	0	52,233	0	0	0	0	0	0	21,416	40,000	0	0	1,000	114,649
<b>Total Number</b>		<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>32</b>
<b>Total Exposure (x\$1000)</b>		<b>0</b>	<b>54,360</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2,000</b>	<b>0</b>	<b>0</b>	<b>23,178</b>	<b>40,000</b>	<b>0</b>	<b>0</b>	<b>7,000</b>	<b>126,538</b>

# Flood Exposure Comparison Dollar Damages



Escondido

Imperial Beach

La Mesa

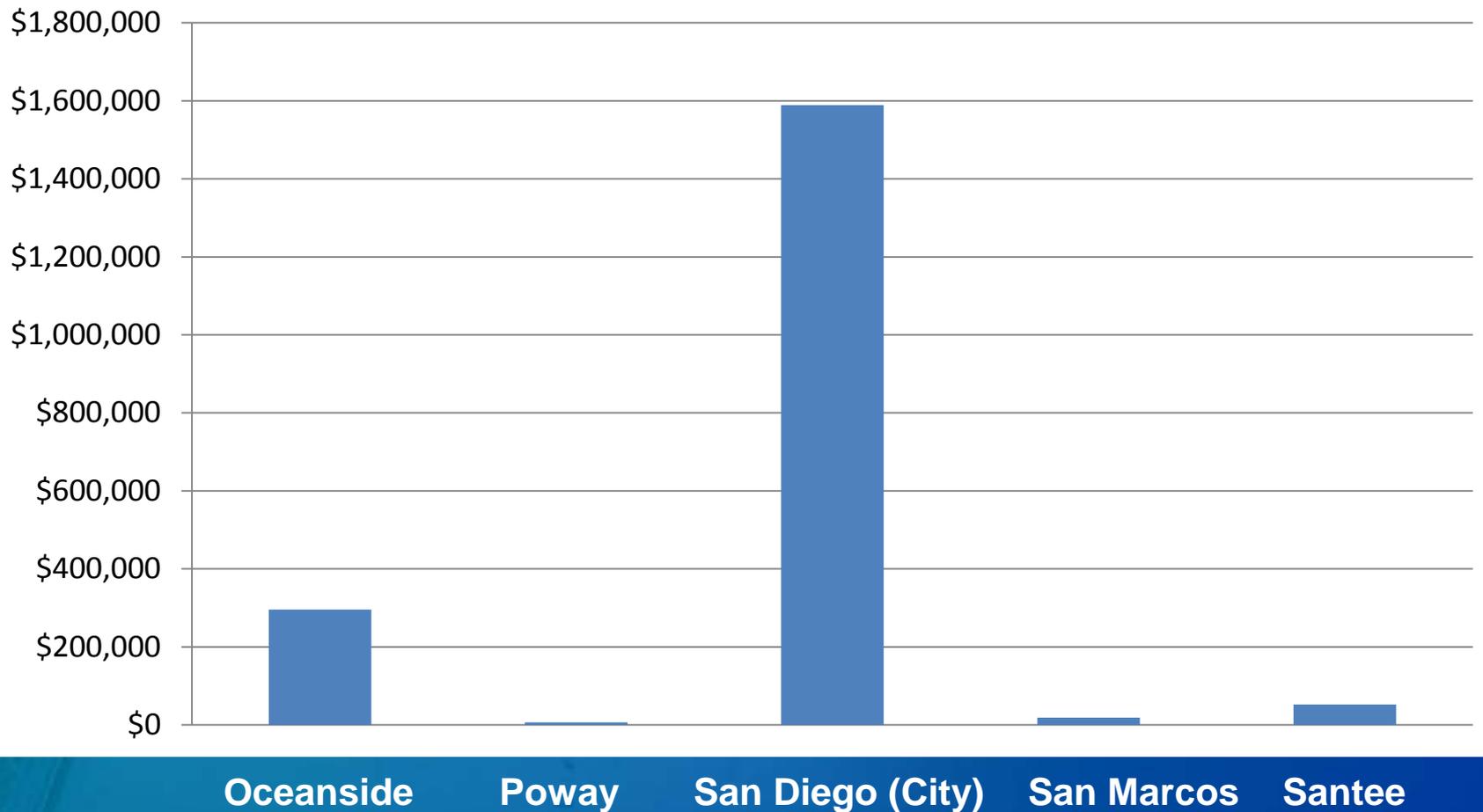
Lemon Grove

National City

# Flood Exposure Estimates to Critical Uses

Jurisdiction	Data	AIR	BRDG	BUS	COM	ELEC	EMER	GOVT	HOSP	INFR	PORT	POT	RAIL	SCH	Total
Oceanside	Number	1	19	0	1	0	2	1	0	10	0	0	0	2	36
	Exposure (x\$1000)	200,000	69,736	0	2,000	0	4,000	2,000	0	15,959	0	0	0	2,000	295,695
Poway	Number	0	7	0	1	0	0	0	0	0	0	0	0	1	9
	Exposure (x\$1000)	0	3,178	0	2,000	0	0	0	0	0	0	0	0	1,000	6,178
San Diego (City)	Number	0	50	1	4	0	0	0	2	52	49	0	2	2	162
	Exposure (x\$1000)	0	281,985	2,000	8,000	0	0	0	200,000	111,415	980,000	0	4,000	2,000	1,589,400
San Marcos	Number	0	3	0	0	0	0	0	0	9	0	0	0	0	12
	Exposure (x\$1000)	0	10,645	0	0	0	0	0	0	8,255	0	0	0	0	18,900
Santee	Number	0	9	0	0	0	0	0	0	0	0	0	0	0	9
	Exposure (x\$1000)	0	52,648	0	0	0	0	0	0	0	0	0	0	0	52,648
<b>Total Number</b>		<b>1</b>	<b>88</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>71</b>	<b>49</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>228</b>
<b>Total Exposure (x\$1000)</b>		<b>200,000</b>	<b>418,192</b>	<b>2,000</b>	<b>12,000</b>	<b>0</b>	<b>4,000</b>	<b>2,000</b>	<b>200,000</b>	<b>135,629</b>	<b>980,000</b>	<b>0</b>	<b>4,000</b>	<b>5,000</b>	<b>1,962,821</b>

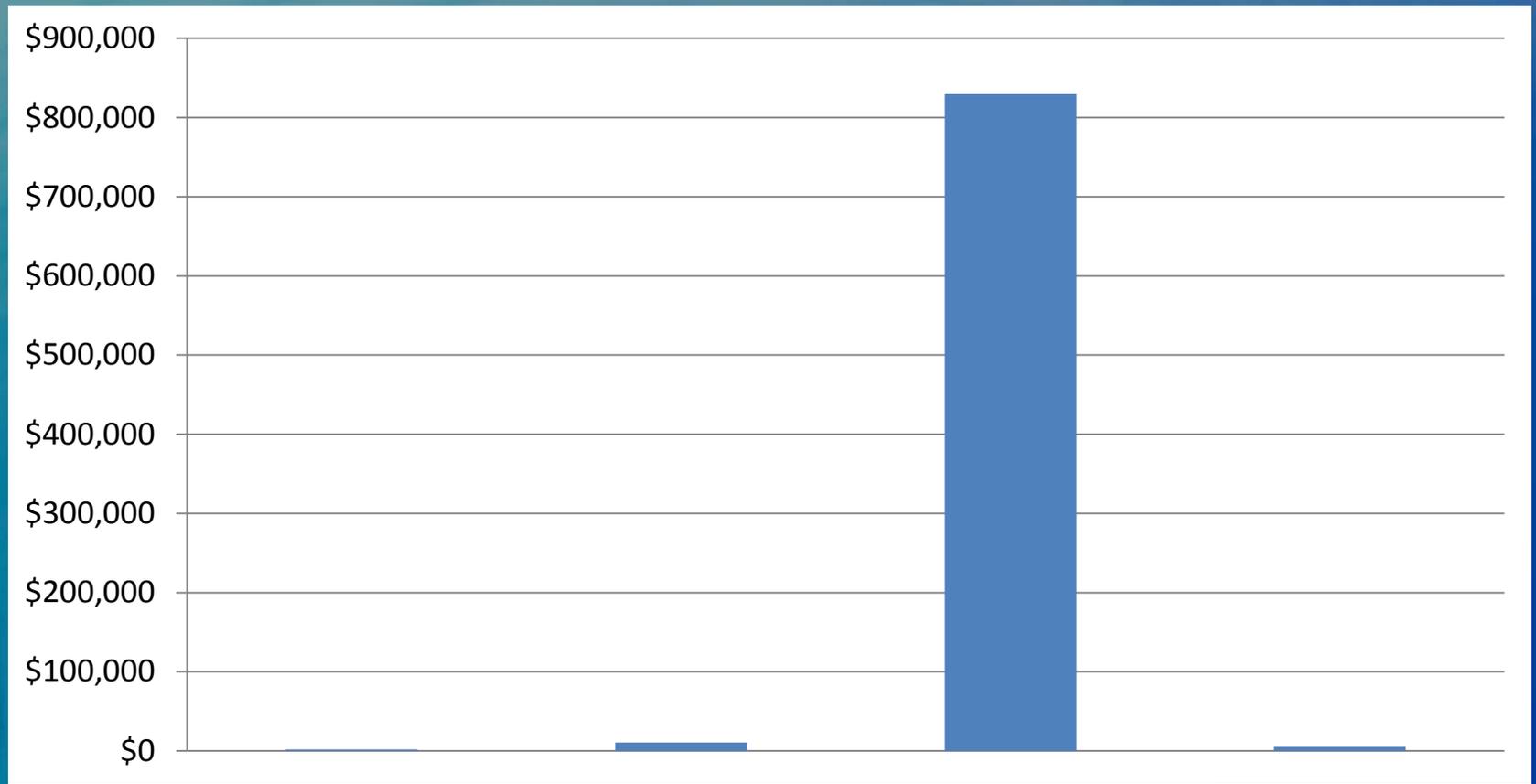
# Flood Exposure Comparison Dollar Damages



# Flood Exposure Estimates to Critical Uses

Jurisdiction	Data	AIR	BRDG	BUS	COM	ELEC	EMER	GOVT	HOSP	INFR	PORT	POT	RAIL	SCH	Total
Solano Beach	Number	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	Exposure (x\$1000)	0	1,920	0	0	0	0	0	0	0	0	0	0	0	1,920
Unincorporated -Rural	Number	0	5	0	0	0	0	0	0	2	0	0	0	2	9
	Exposure (x\$1000)	0	7,754	0	0	0	0	0	0	747	0	0	0	2,000	10,501
Unincorporated - Urban Core	Number	3	48	0	10	0	9	0	0	39	0	0	0	12	121
	Exposure (x\$1000)	600,000	68,527	0	20,000	0	18,000	0	0	111,335	0	0	0	12,000	829,862
Vista	Number	0	0	0	0	0	2	0	0	1	0	0	0	0	3
	Exposure (x\$1000)	0	0	0	0	0	4,000	0	0	1,014	0	0	0	0	5,014
<b>Total Number</b>		<b>3</b>	<b>54</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>42</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>134</b>
<b>Total Exposure (x\$1000)</b>		<b>600,000</b>	<b>78,201</b>	<b>0</b>	<b>20,000</b>	<b>0</b>	<b>22,000</b>	<b>0</b>	<b>0</b>	<b>113,096</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14,000</b>	<b>847,297</b>

# Flood Exposure Comparison Dollar Damages



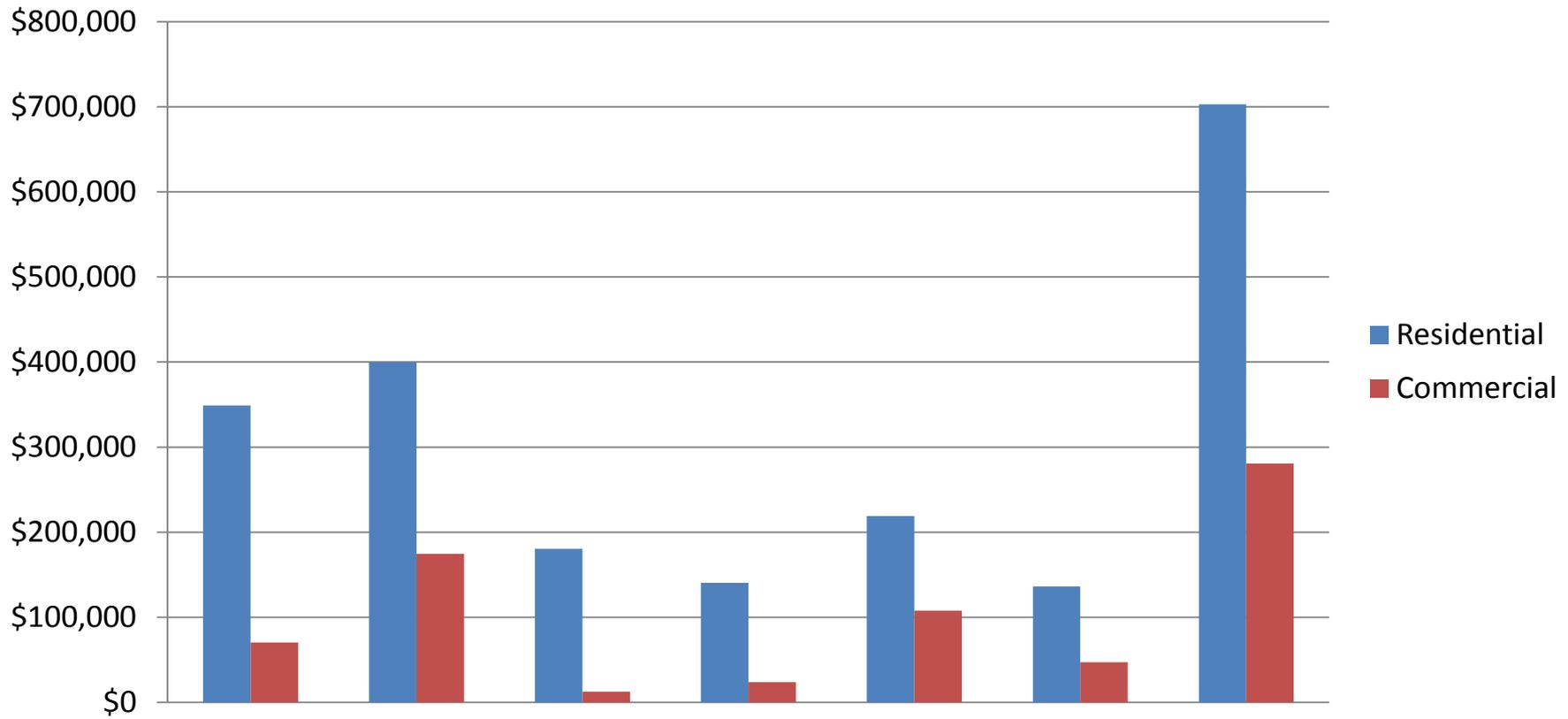
Solano Beach

Unincorporated-  
Rural

Unincorporated-  
Urban Core

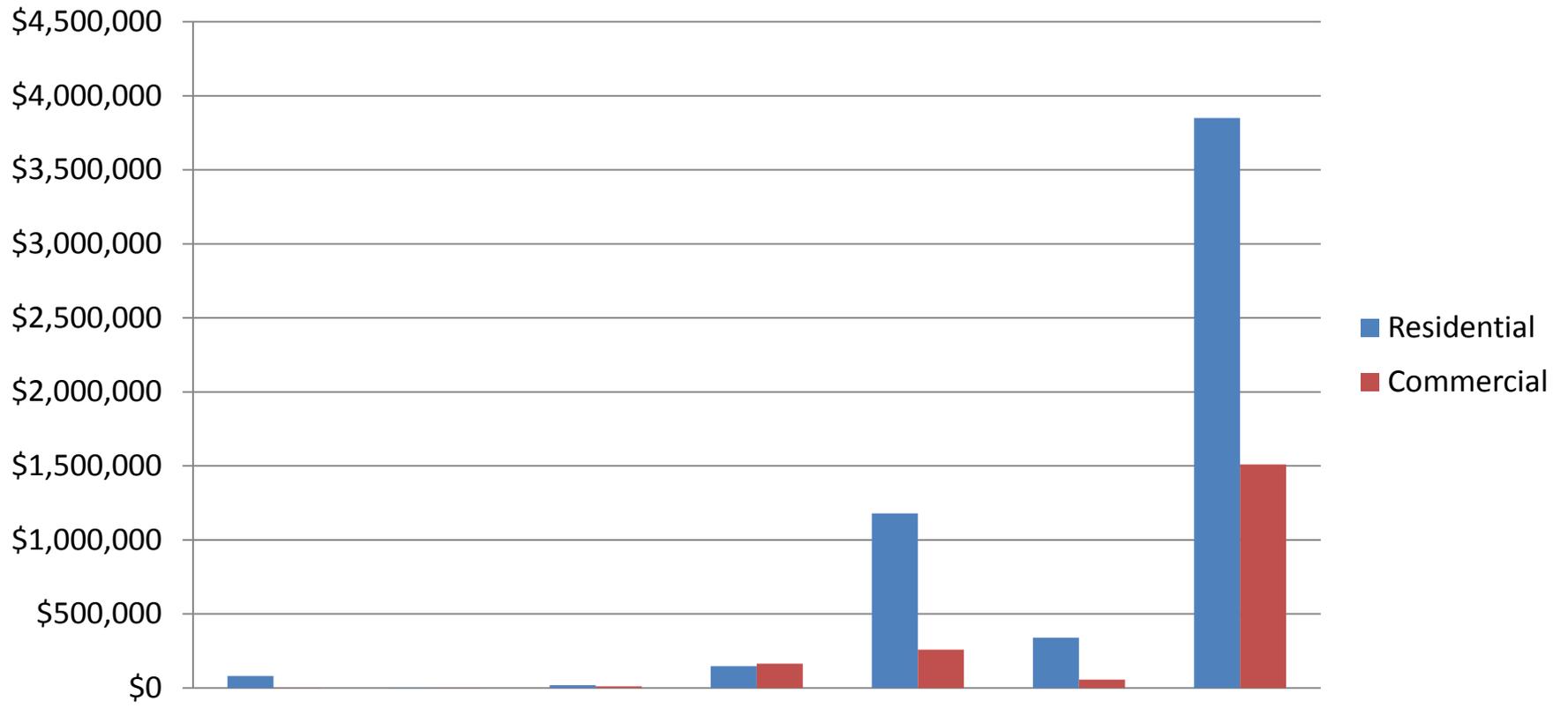
Vista

# Flood Exposure Comparison Dollar Damages



Carlsbad Chula Vista Coronado Del Mar El Cajon Encinitas Escondido

# Flood Exposure Comparison Dollar Damages



Imperial  
Beach

La Mesa

Lemon  
Grove

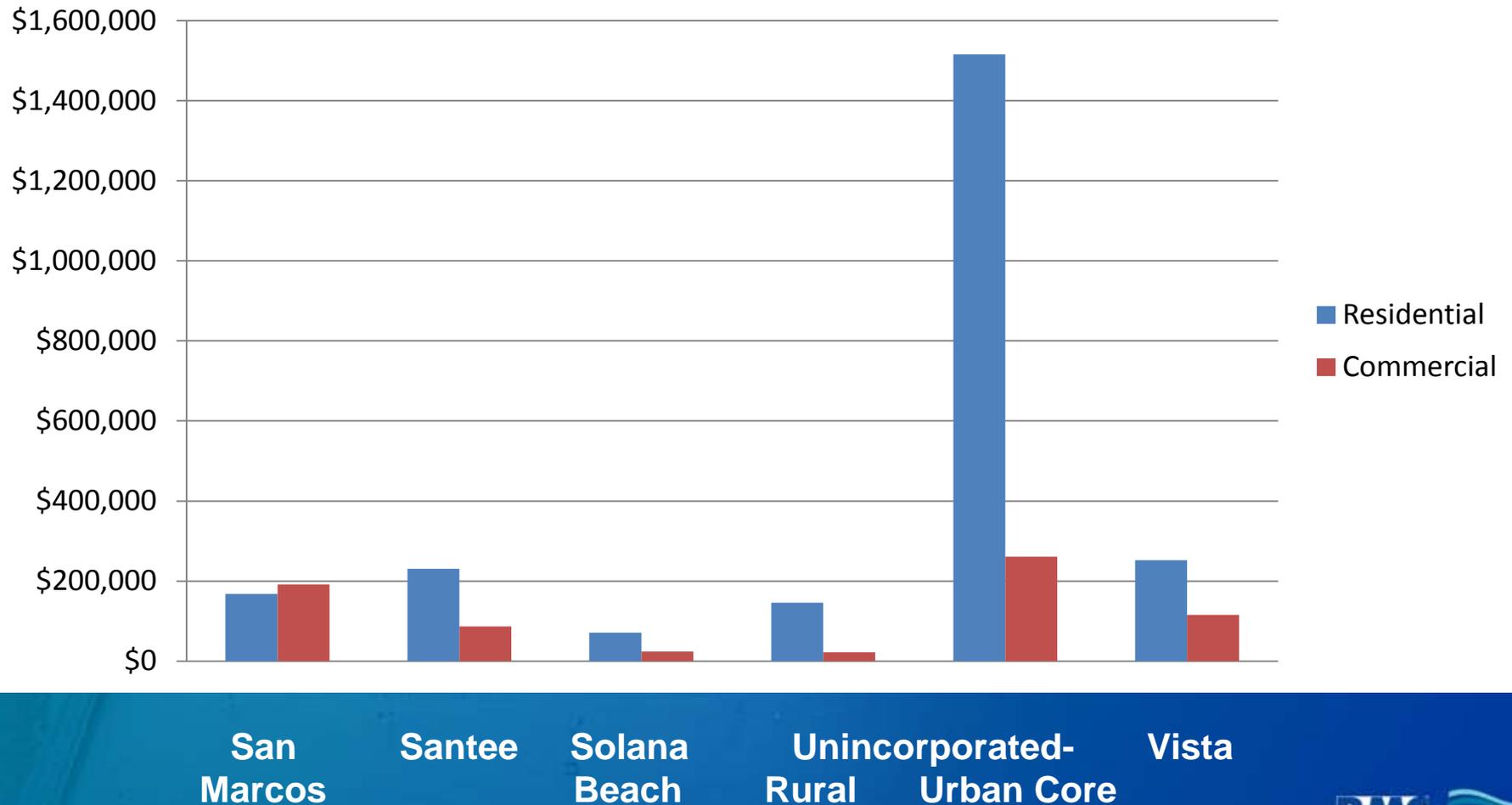
National  
City

Ocean-  
side

Poway

San Diego  
City

# Flood Exposure Comparison Dollar Damages

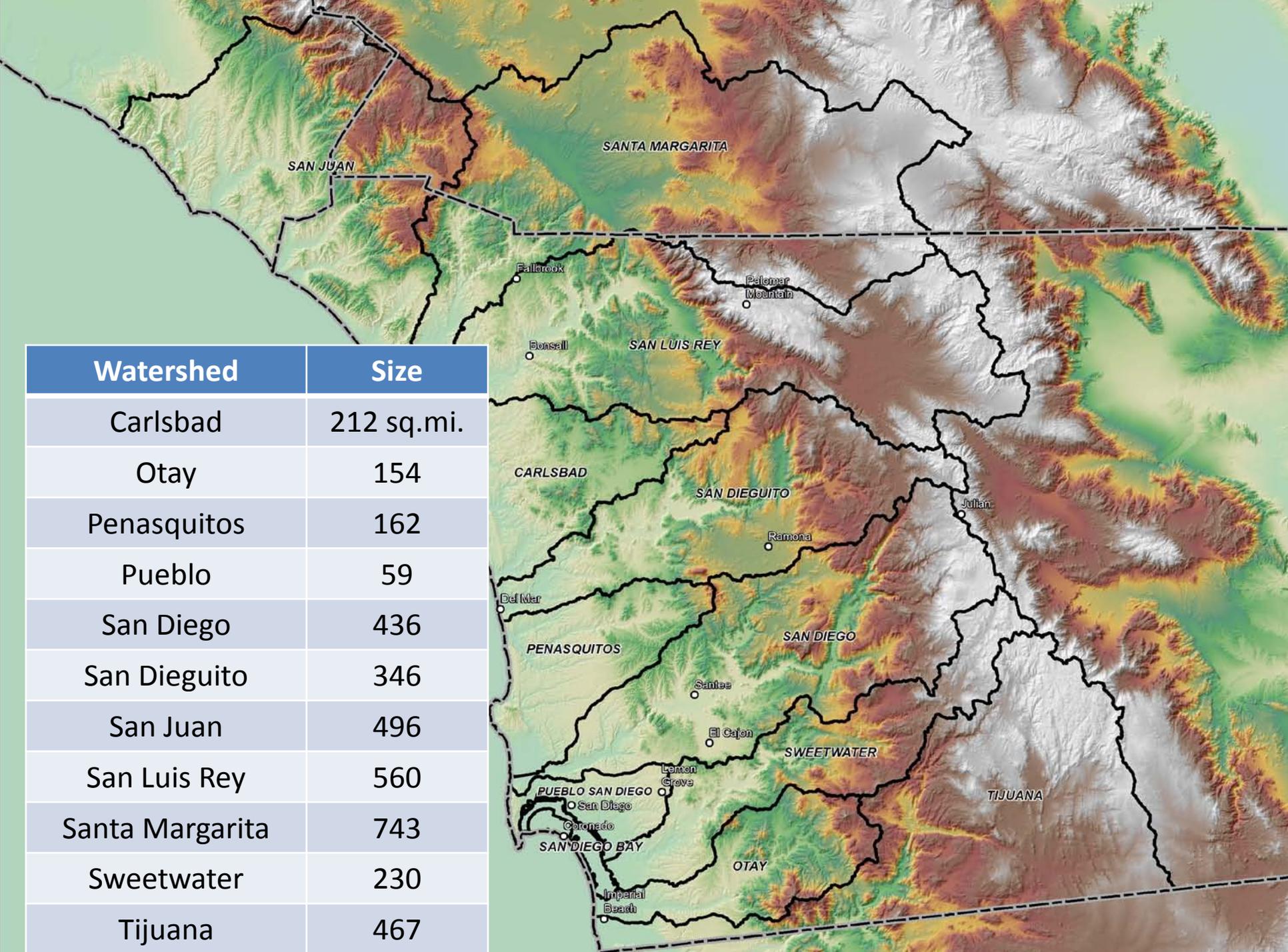




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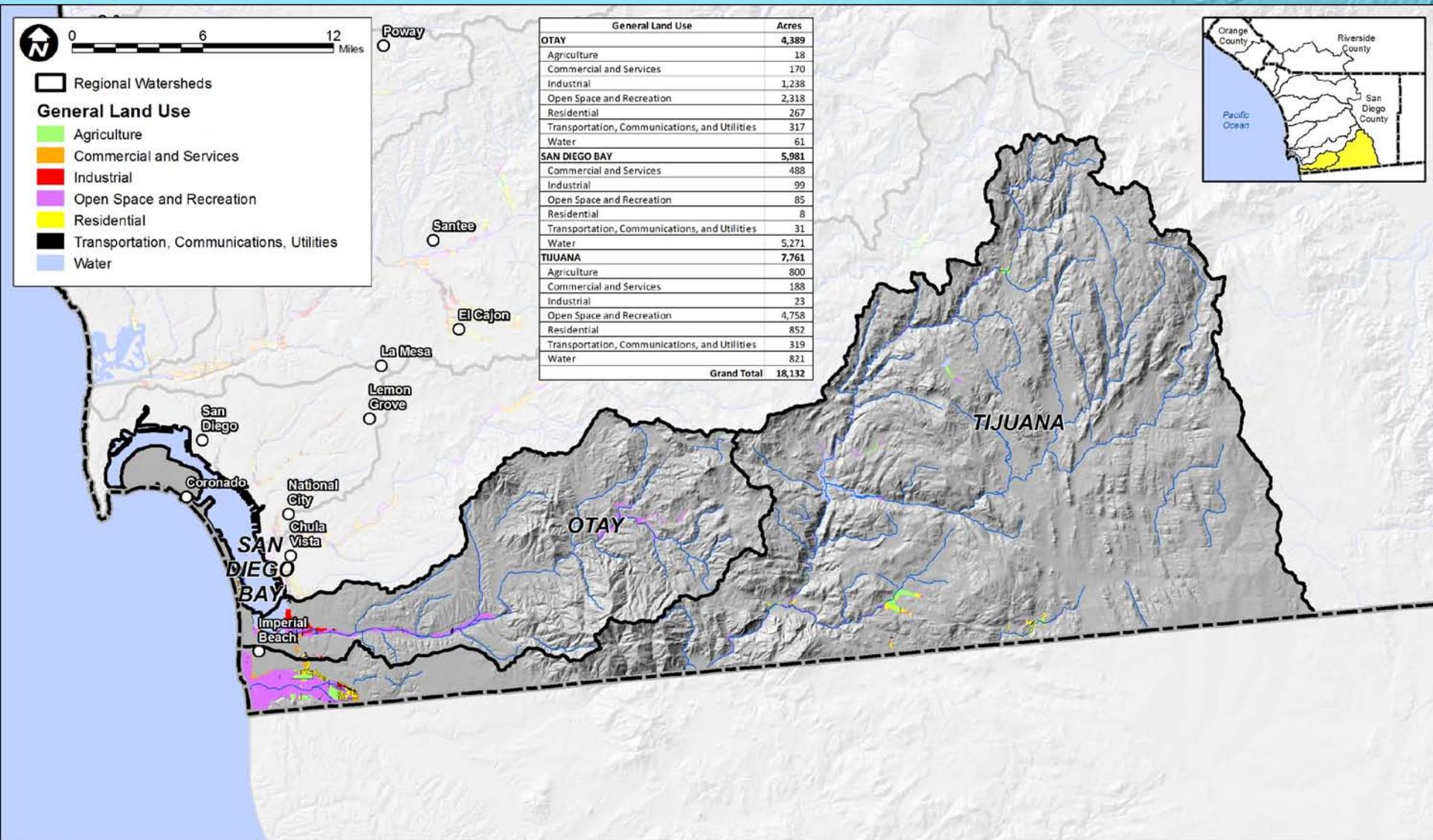
# Watershed Mapping Flood Exposure



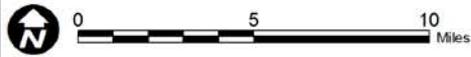


Watershed	Size
Carlsbad	212 sq.mi.
Otay	154
Penasquitos	162
Pueblo	59
San Diego	436
San Dieguito	346
San Juan	496
San Luis Rey	560
Santa Margarita	743
Sweetwater	230
Tijuana	467

# Flood Hazards and Landuses – Oaty / Tijuana



# Flood Hazards and Landuses – Pueblo / Sweetwater

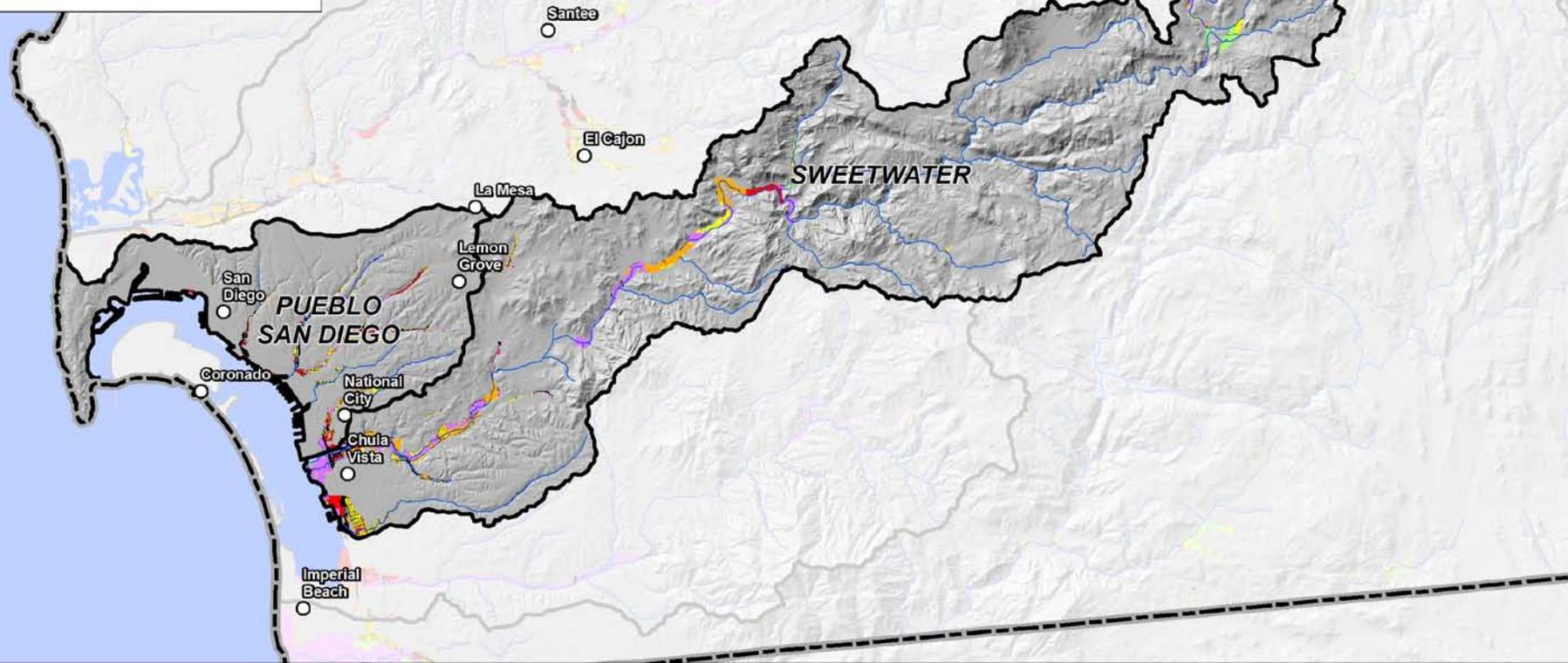


Regional Watersheds

General Land Use

- Agriculture
- Commercial and Services
- Industrial
- Open Space and Recreation
- Residential
- Transportation, Communications, Utilities
- Water

General Land Use	Acres
<b>PUEBLO SAN DIEGO</b>	<b>1,594</b>
Commercial and Services	217
Industrial	165
Open Space and Recreation	330
Residential	306
Transportation, Communications, and Utilities	555
Water	22
<b>SWEETWATER</b>	<b>5,336</b>
Agriculture	273
Commercial and Services	1,204
Industrial	371
Open Space and Recreation	1,815
Residential	825
Transportation, Communications, and Utilities	751
Water	97
<b>Grand Total</b>	<b>6,931</b>

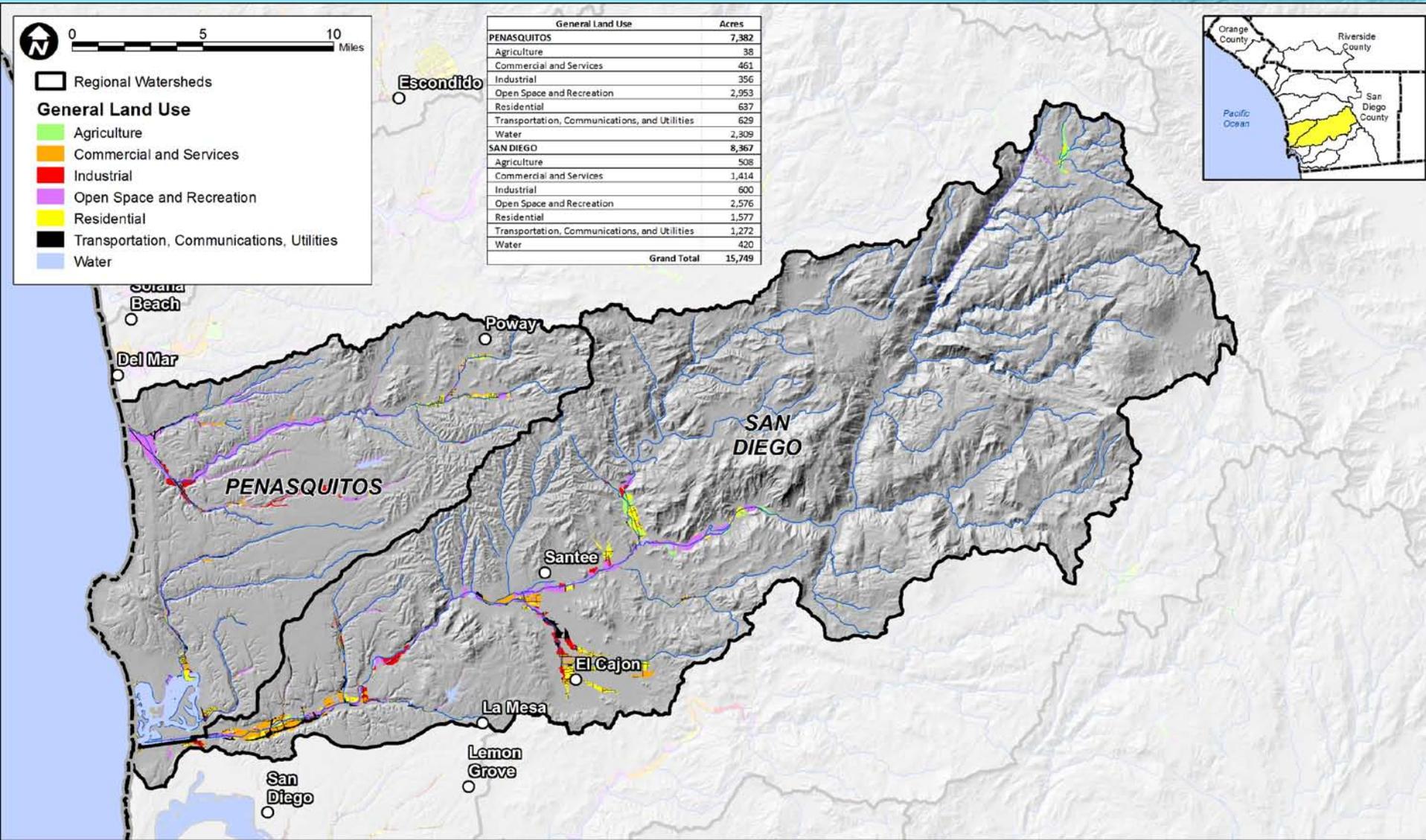


# Summary of Landuse Based Flood Hazard Inventory

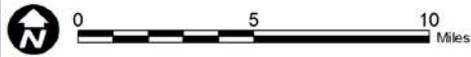
AREA 1 - General Land Use	Acres
<b>OTAY</b>	<b>4,389</b>
Agriculture	18
Commercial and Services	170
Industrial	1,238
Open Space and Recreation	2,318
Residential	267
Transportation, Communications, and Utilities	317
Water	61
<b>SAN DIEGO BAY</b>	<b>5,981</b>
Commercial and Services	488
Industrial	99
Open Space and Recreation	85
Residential	8
Transportation, Communications, and Utilities	31
Water	5,271
<b>TIJUANA</b>	<b>7,761</b>
Agriculture	800
Commercial and Services	188
Industrial	23
Open Space and Recreation	4,758
Residential	852
Transportation, Communications, and Utilities	319
Water	821
<b>Grand Total</b>	<b>18,132</b>

AREA 2 - General Land Use	Acres
<b>PUEBLO SAN DIEGO</b>	<b>1,594</b>
Commercial and Services	217
Industrial	165
Open Space and Recreation	330
Residential	306
Transportation, Communications, and Utilities	555
Water	22
<b>SWEETWATER</b>	<b>5,336</b>
Agriculture	273
Commercial and Services	1,204
Industrial	371
Open Space and Recreation	1,815
Residential	825
Transportation, Communications, and Utilities	751
Water	97
<b>Grand Total</b>	<b>6,931</b>

# Flood Hazards and Landuses – Penasquitos / San Diego



# Flood Hazards and Landuses – Carlsbad / San Dieguito

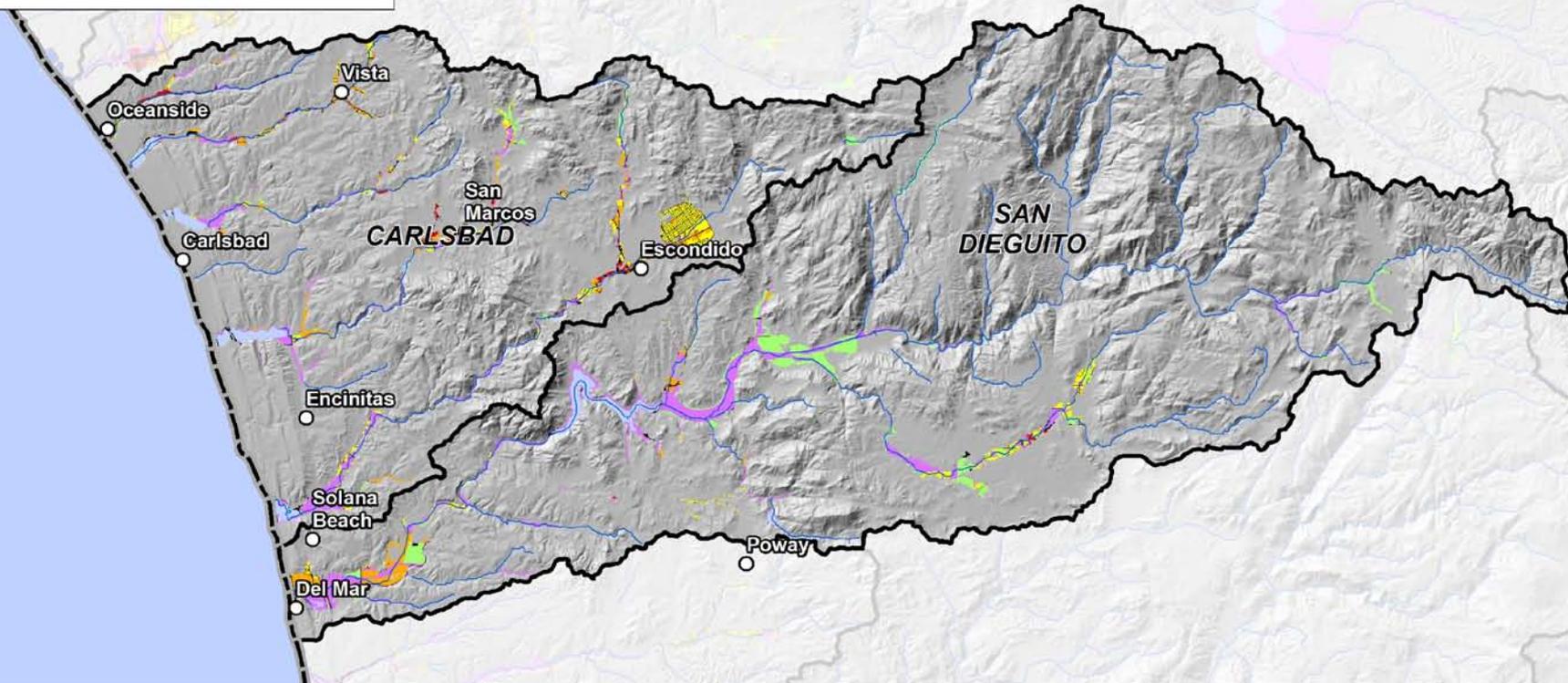


Regional Watersheds

General Land Use

- Agriculture
- Commercial and Services
- Industrial
- Open Space and Recreation
- Residential
- Transportation, Communications, Utilities
- Water

General Land Use	Acres
<b>CARLSBAD</b>	<b>8,464</b>
Agriculture	354
Commercial and Services	1,345
Industrial	271
Open Space and Recreation	2,474
Residential	1,721
Transportation, Communications, and Utilities	1,082
Water	1,217
<b>SAN DIEGUITO</b>	<b>9,864</b>
Agriculture	2,352
Commercial and Services	953
Industrial	44
Open Space and Recreation	4,326
Residential	853
Transportation, Communications, and Utilities	344
Water	993
<b>Grand Total</b>	<b>18,328</b>

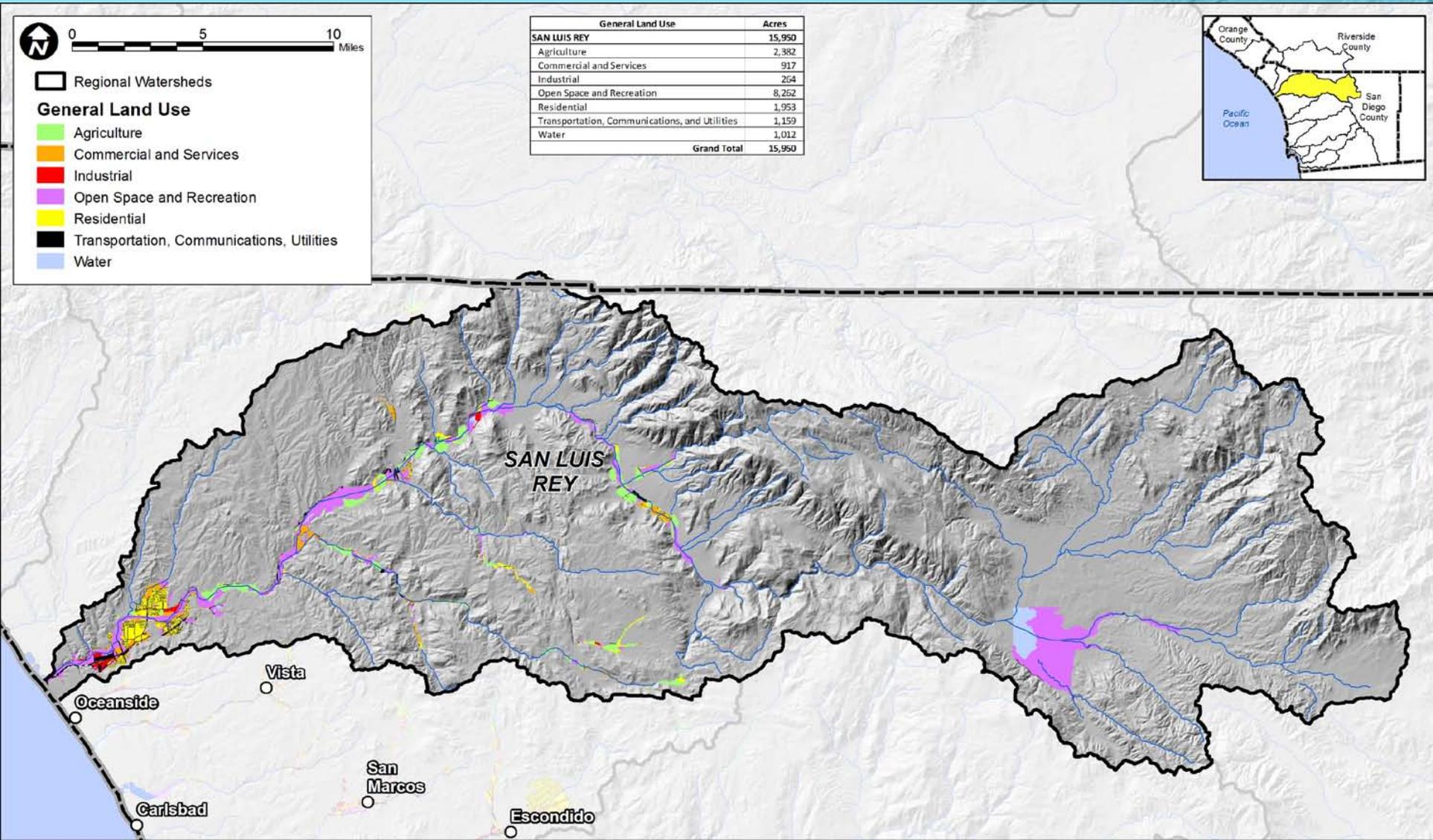


# Summary of Landuse Based Flood Hazard Inventory

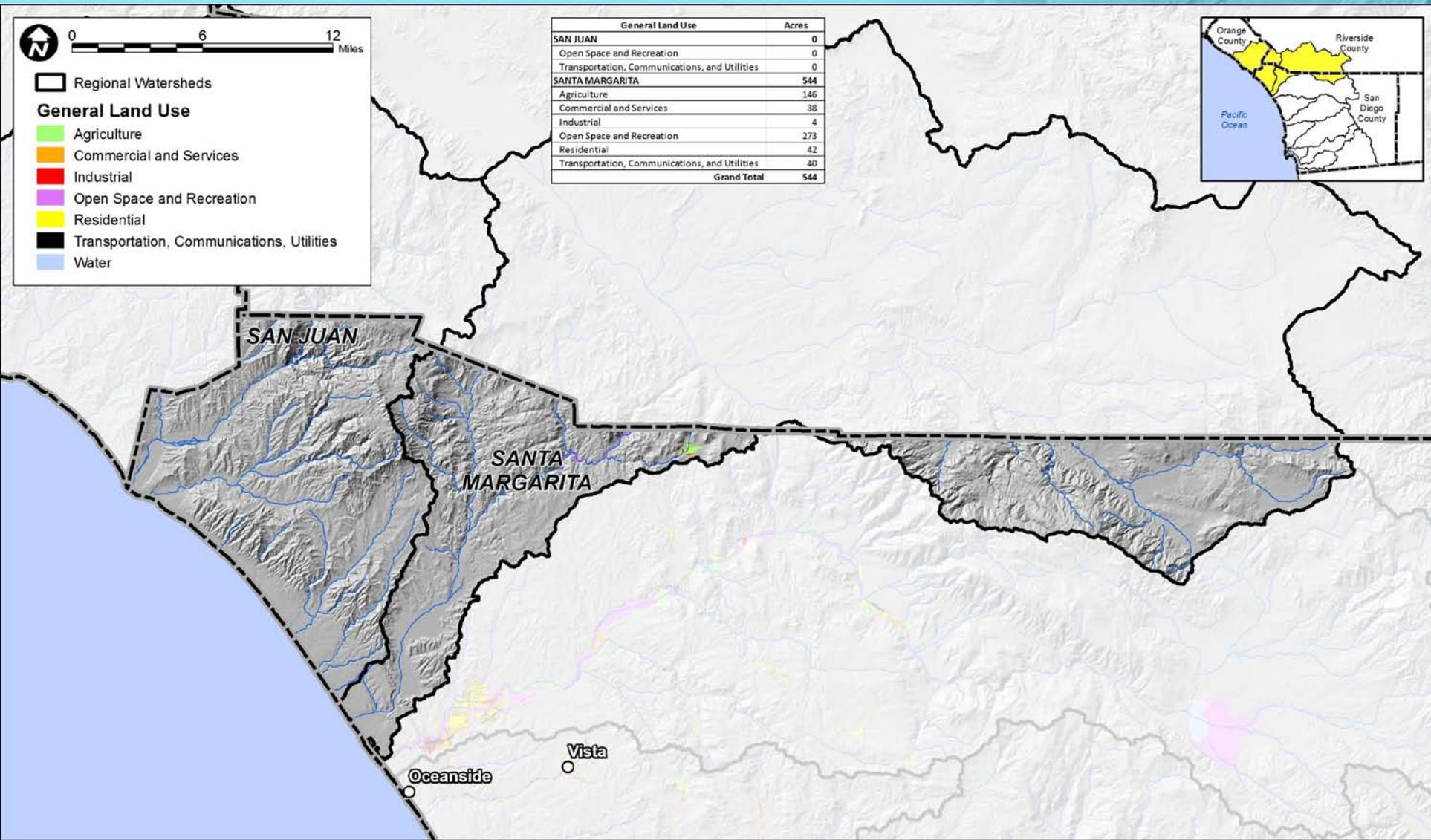
AREA 3 - General Land Use	Acres
<b>PENASQUITOS</b>	<b>7,382</b>
Agriculture	38
Commercial and Services	461
Industrial	356
Open Space and Recreation	2,953
Residential	637
Transportation, Communications, and Utilities	629
Water	2,309
<b>SAN DIEGO</b>	<b>8,367</b>
Agriculture	508
Commercial and Services	1,414
Industrial	600
Open Space and Recreation	2,576
Residential	1,577
Transportation, Communications, and Utilities	1,272
Water	420
<b>Grand Total</b>	<b>15,749</b>

AREA 4 - General Land Use	Acres
<b>CARLSBAD</b>	<b>8,464</b>
Agriculture	354
Commercial and Services	1,345
Industrial	271
Open Space and Recreation	2,474
Residential	1,721
Transportation, Communications, and Utilities	1,082
Water	1,217
<b>SAN DIEGUITO</b>	<b>9,864</b>
Agriculture	2,352
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# Flood Hazards and Landuses – San Luis Rey



# Flood Hazards and Landuses – San Juan / Santa Margarita

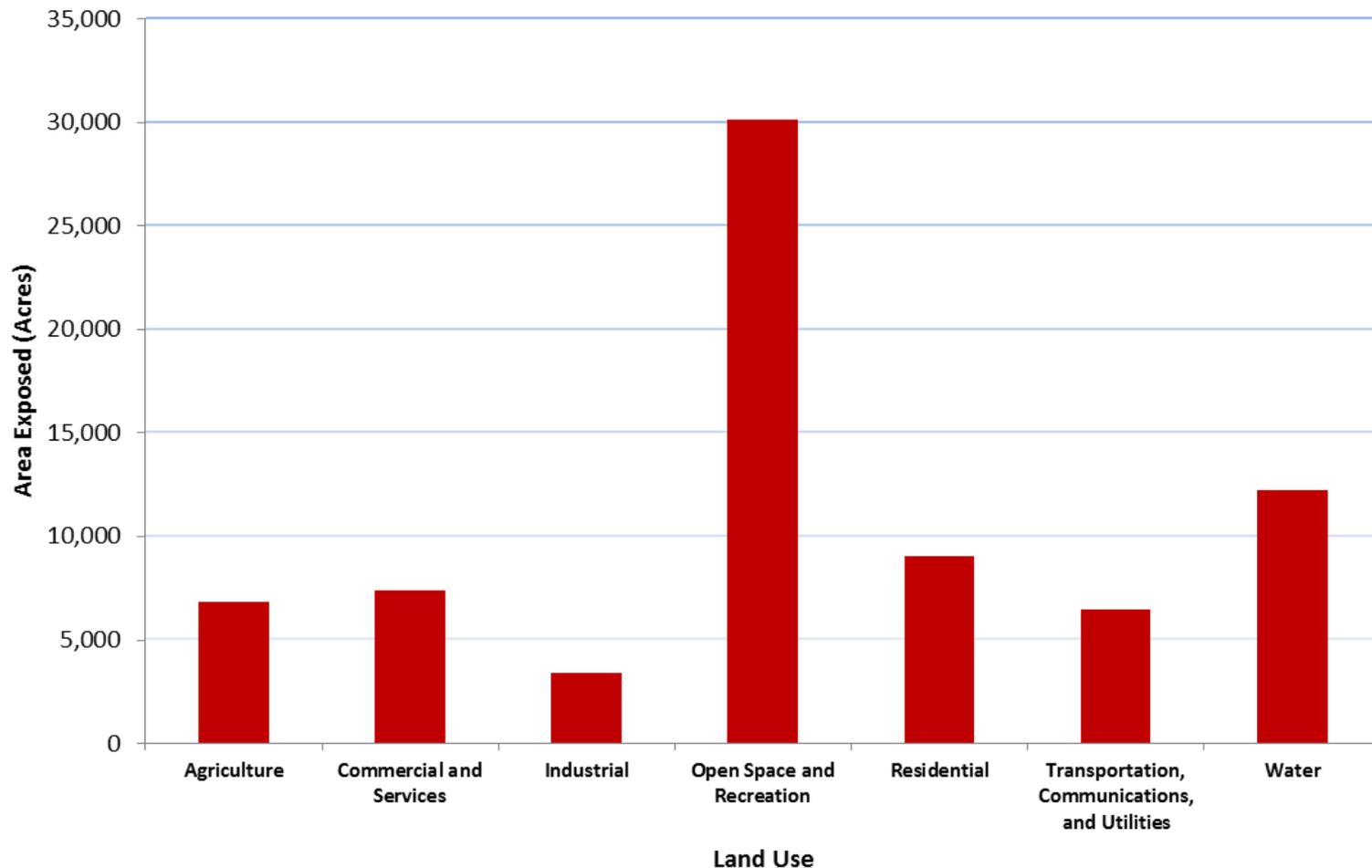


# Summary of Landuse Based Flood Hazard Inventory

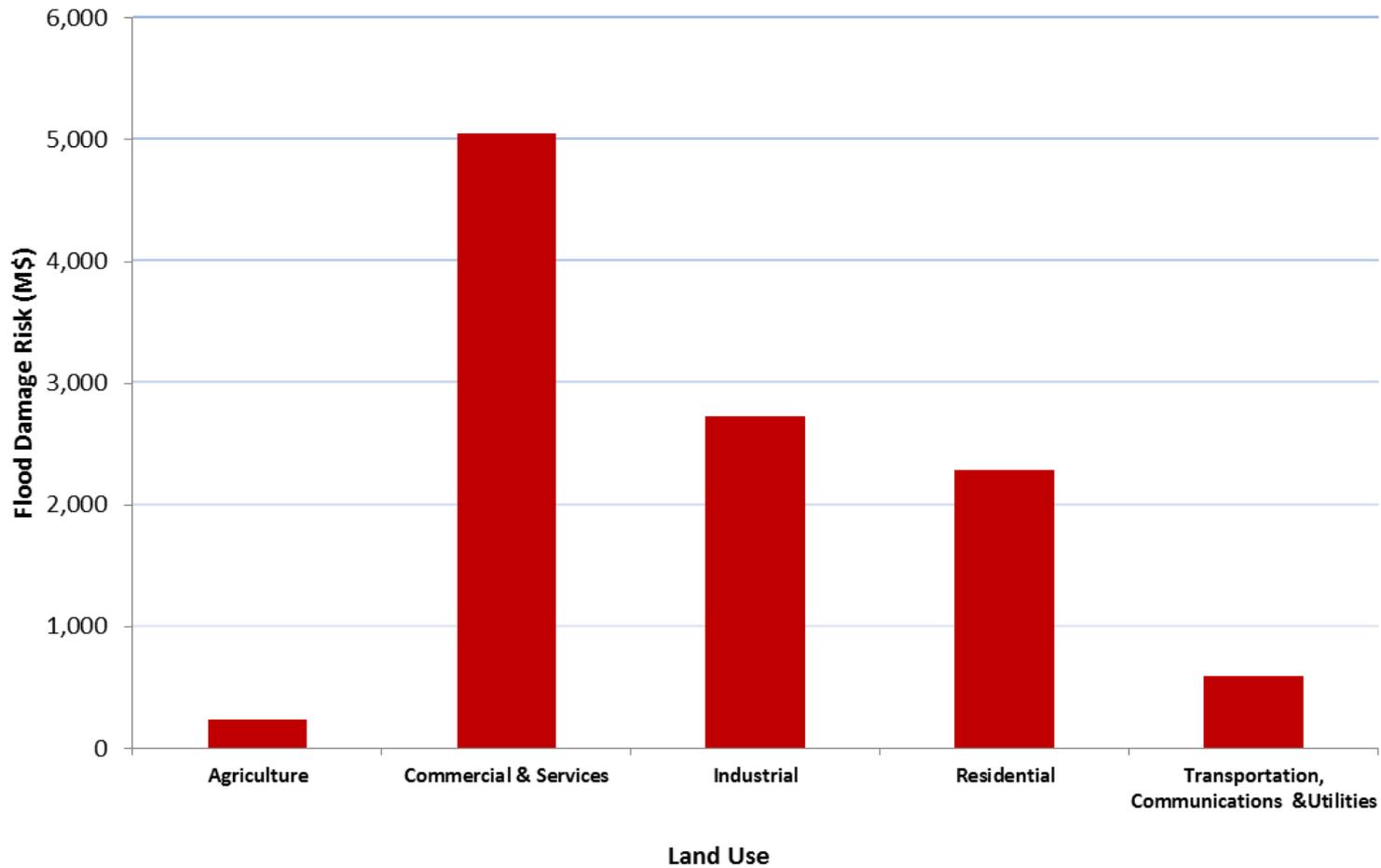
AREA 5 - General Land Use	Acres
<b>SAN LUIS REY</b>	<b>15,950</b>
Agriculture	2,382
Commercial and Services	917
Industrial	264
Open Space and Recreation	8,262
Residential	1,953
Transportation, Communications, and Utilities	1,159
Water	1,012
<b>Grand Total</b>	<b>15,950</b>

AREA 6 - General Land Use	Acres
<b>SAN JUAN</b>	<b>0</b>
Open Space and Recreation	0
Transportation, Communications, and Utilities	0
<b>SANTA MARGARITA</b>	<b>544</b>
Agriculture	146
Commercial and Services	38
Industrial	4
Open Space and Recreation	273
Residential	42
Transportation, Communications, and Utilities	40
<b>Grand Total</b>	<b>544</b>

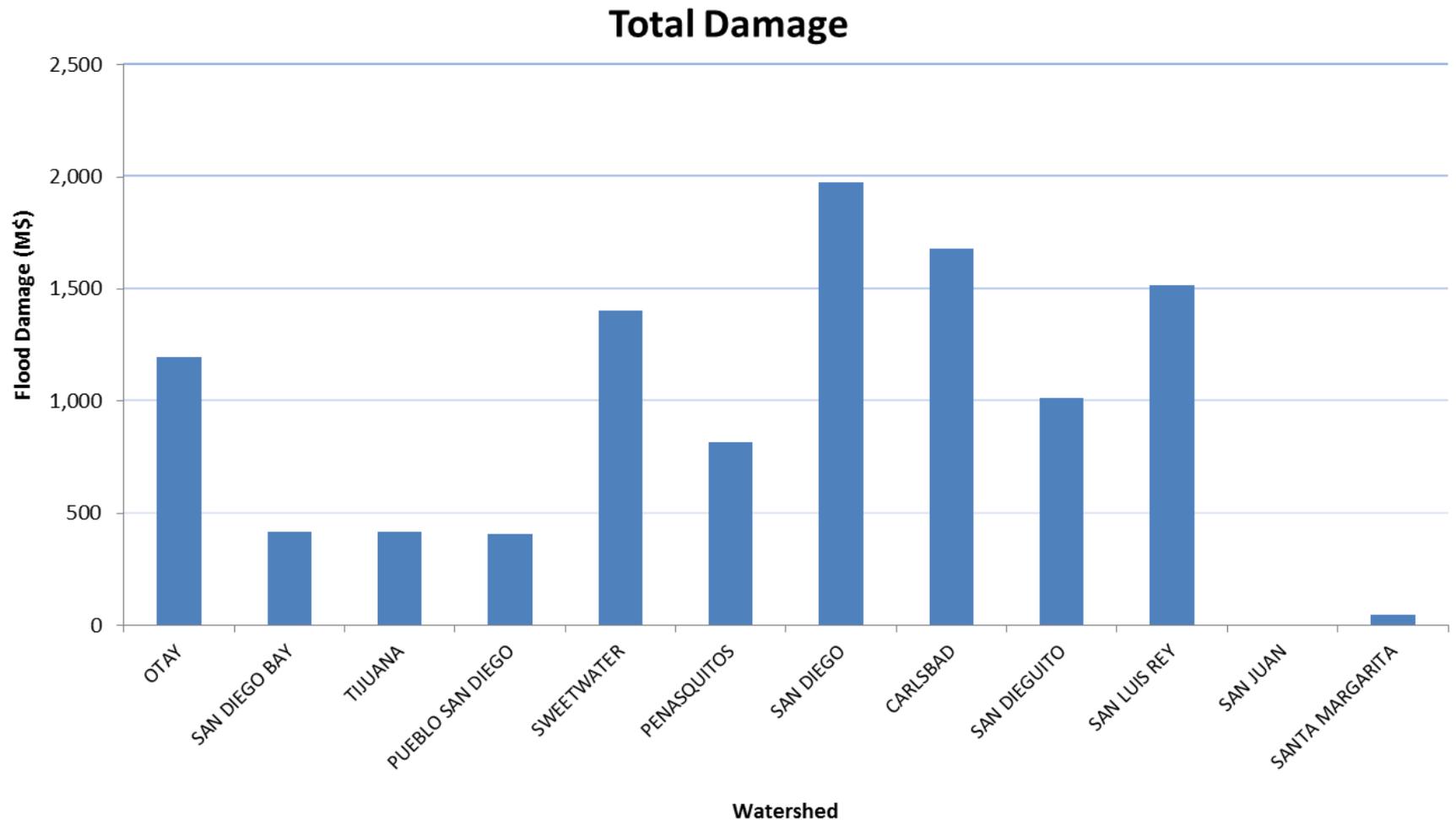
# Summary Distribution of Landuse Exposure in Floodplains



# Summary of Flood Exposure Damage Costs



# Flood Exposure Totals Damage by Watershed





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# Integrated Flood Management (IFM) Planning



# Potential IFM Strategies Change at Different Watershed Scales

## IFM interconnection of flood management with larger water resources management and landuse planning

- Three different watershed scales
  - Regional watershed scale
  - City/community scale
  - Local neighborhood scale

# Local Neighborhood Scale



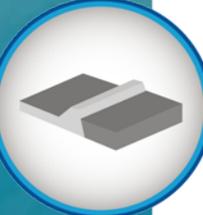
Emergency  
Evacuation/Risk  
Management



Community  
Measures



# Local Neighborhood Scale



Flood  
Defense/Flood  
Protection Facilities



Wetlands &  
Environmental  
Buffers

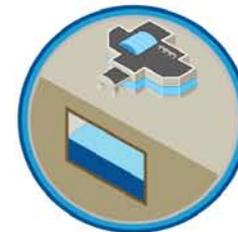
# Local Neighborhood Scale



LID: Green  
Roofs & Swales



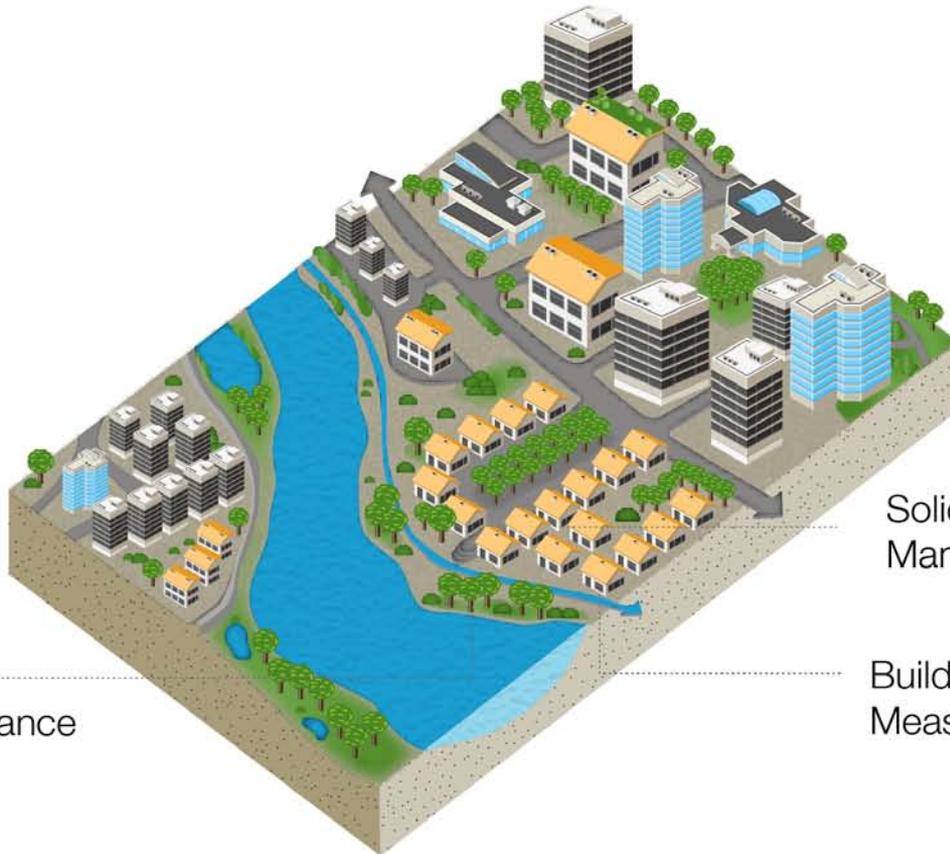
Flood Storage:  
Underground Rain  
Storage



# Local Neighborhood Scale



Flood  
Conveyance



Solid Waste  
Management



Building Design  
Measures



# City Watershed Scale



Flood Storage:  
Reservoirs, Lakes



Conveyance:  
Relief Channel



# City Watershed Scale



Land Use Planning:  
Flood Zones

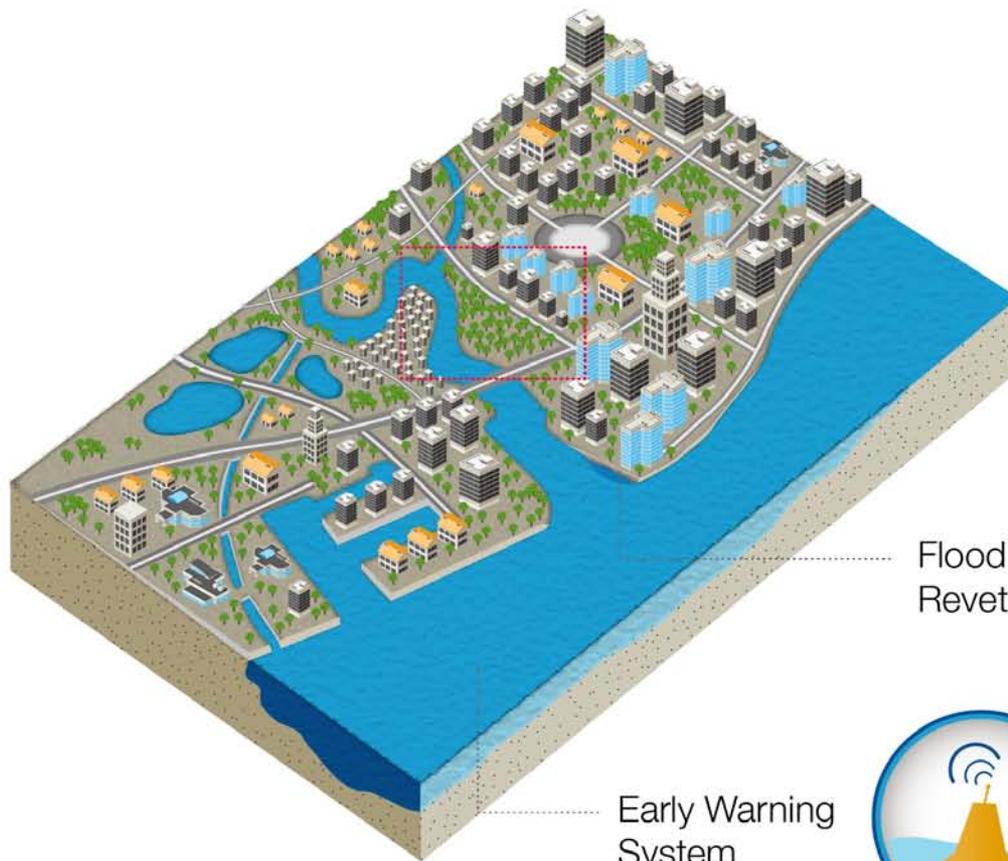
Zoom:  
Local Watershed  
Scale



Evacuation Planning/  
Risk Management



# City Watershed Scale



Flood Defense:  
Revetments



Early Warning  
System



# Regional Watershed Scale



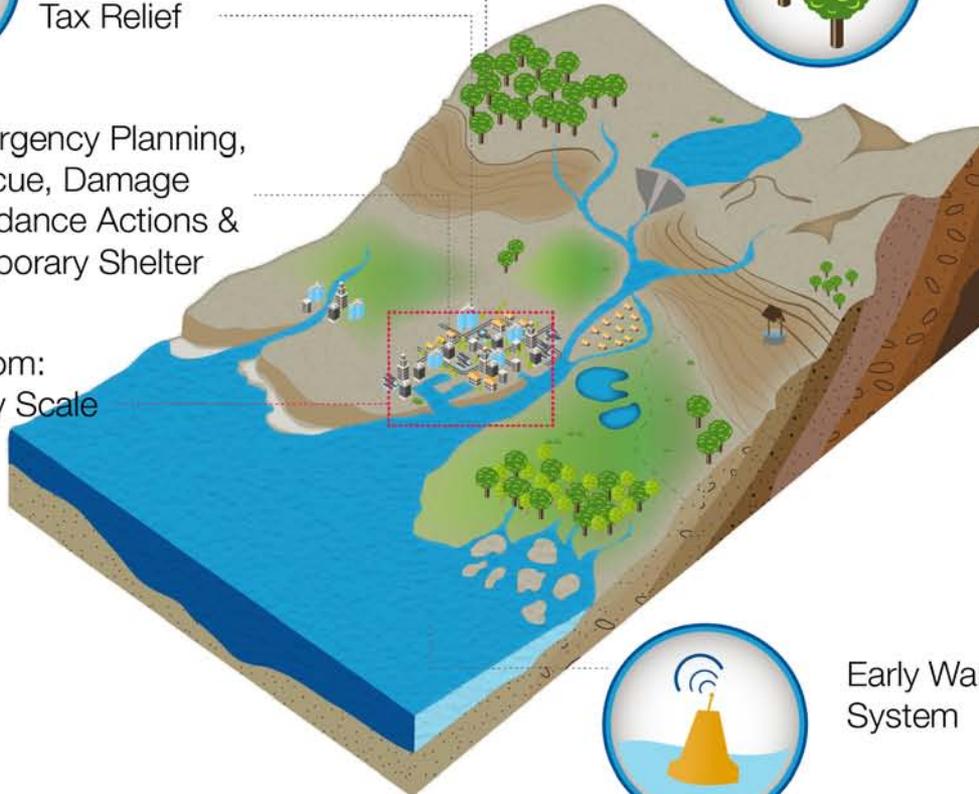
Flood Insurance,  
Compensation &  
Tax Relief



Infiltration:  
Forest Plantation

Emergency Planning,  
Rescue, Damage  
Avoidance Actions &  
Temporary Shelter

Zoom:  
City Scale

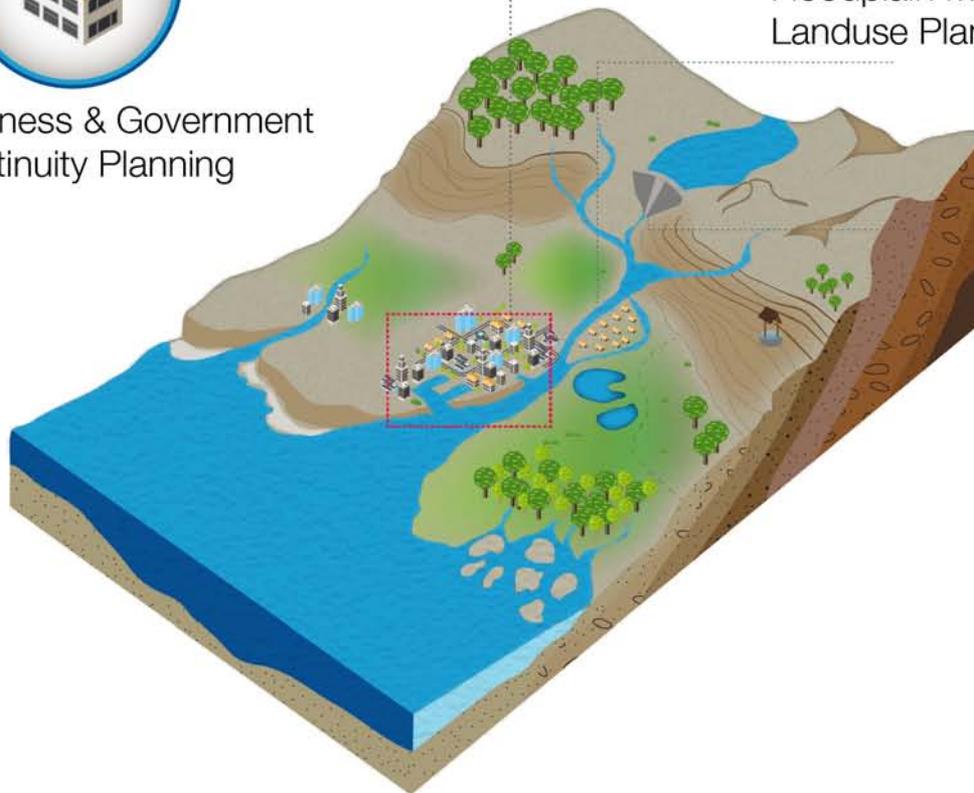


Early Warning  
System

# Regional Watershed Scale



Business & Government  
Continuity Planning



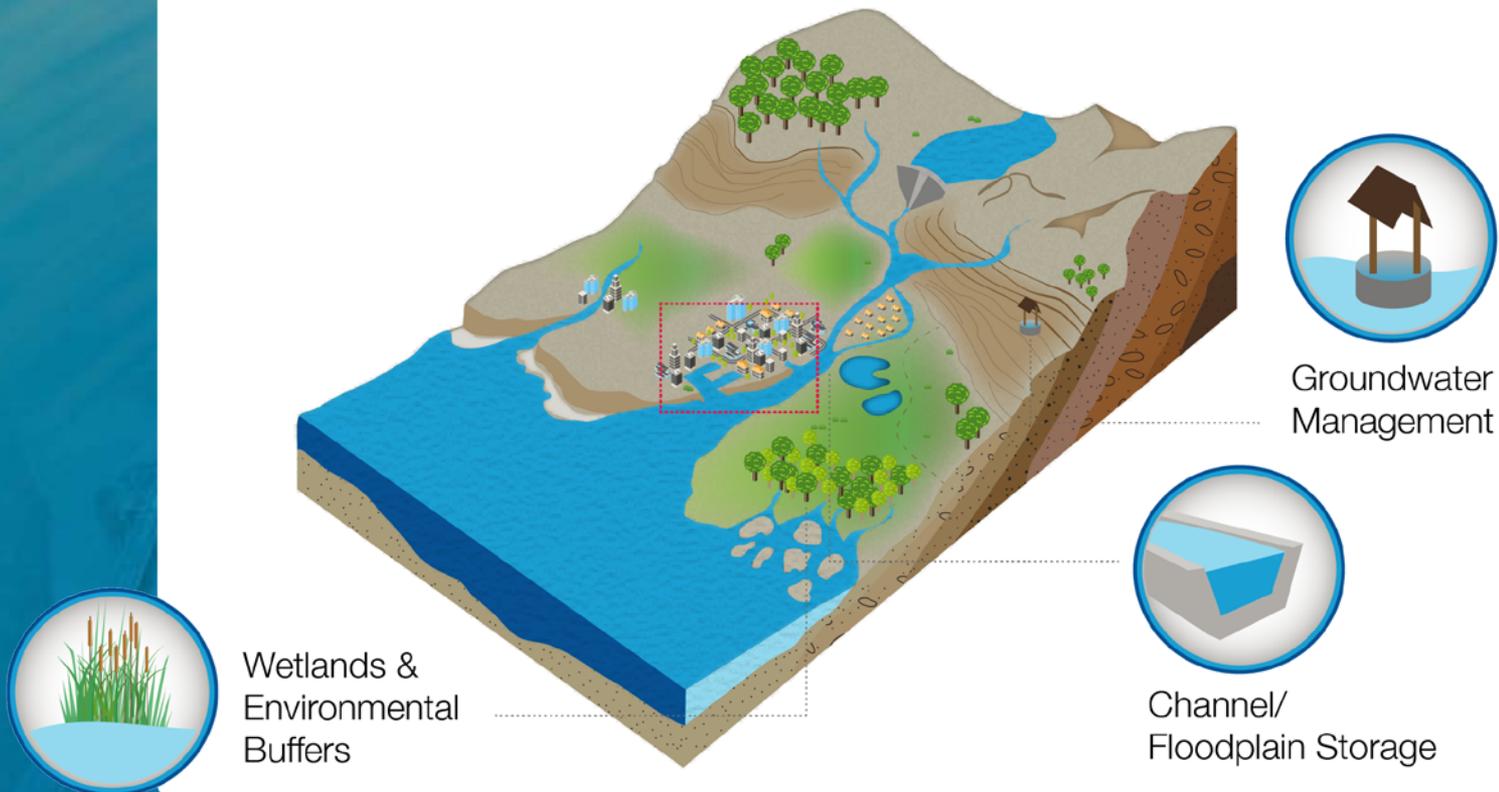
Floodplain Management/  
Landuse Planning



Flood Storage:  
Dams &  
Reservoirs



# Regional Watershed Scale



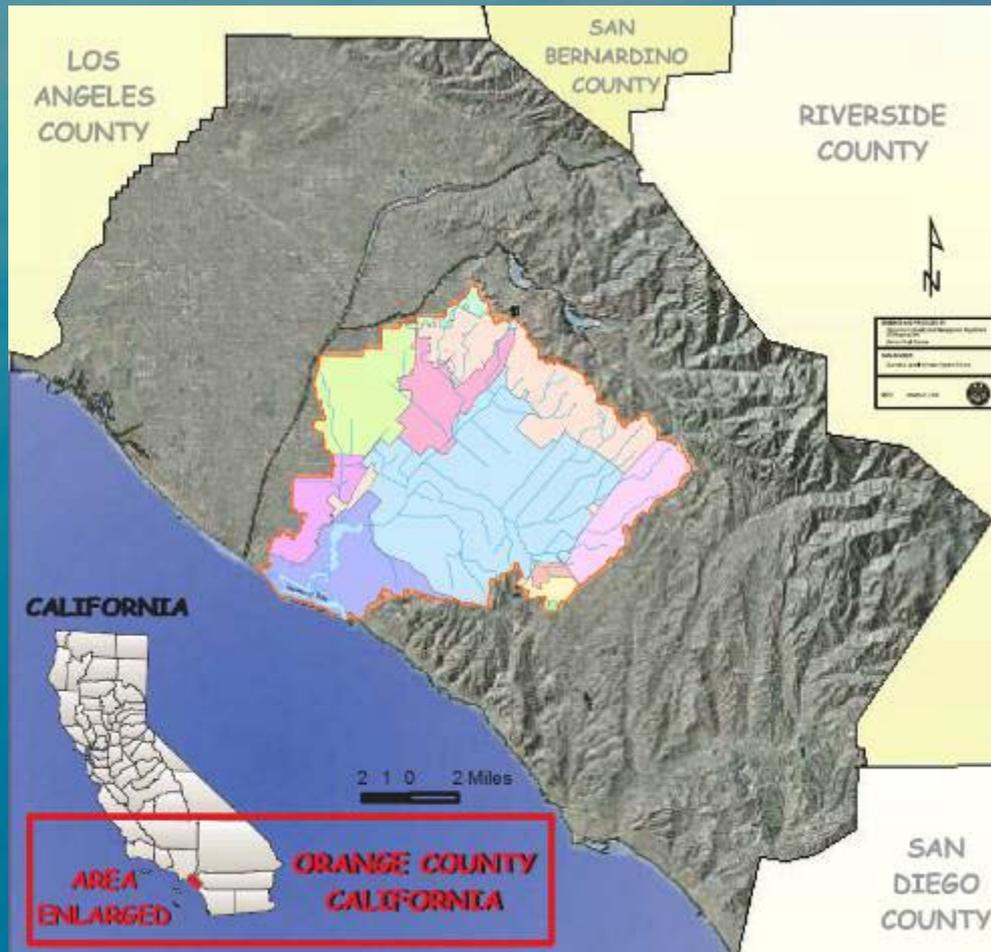


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# Example of Regional IRM Watershed Application

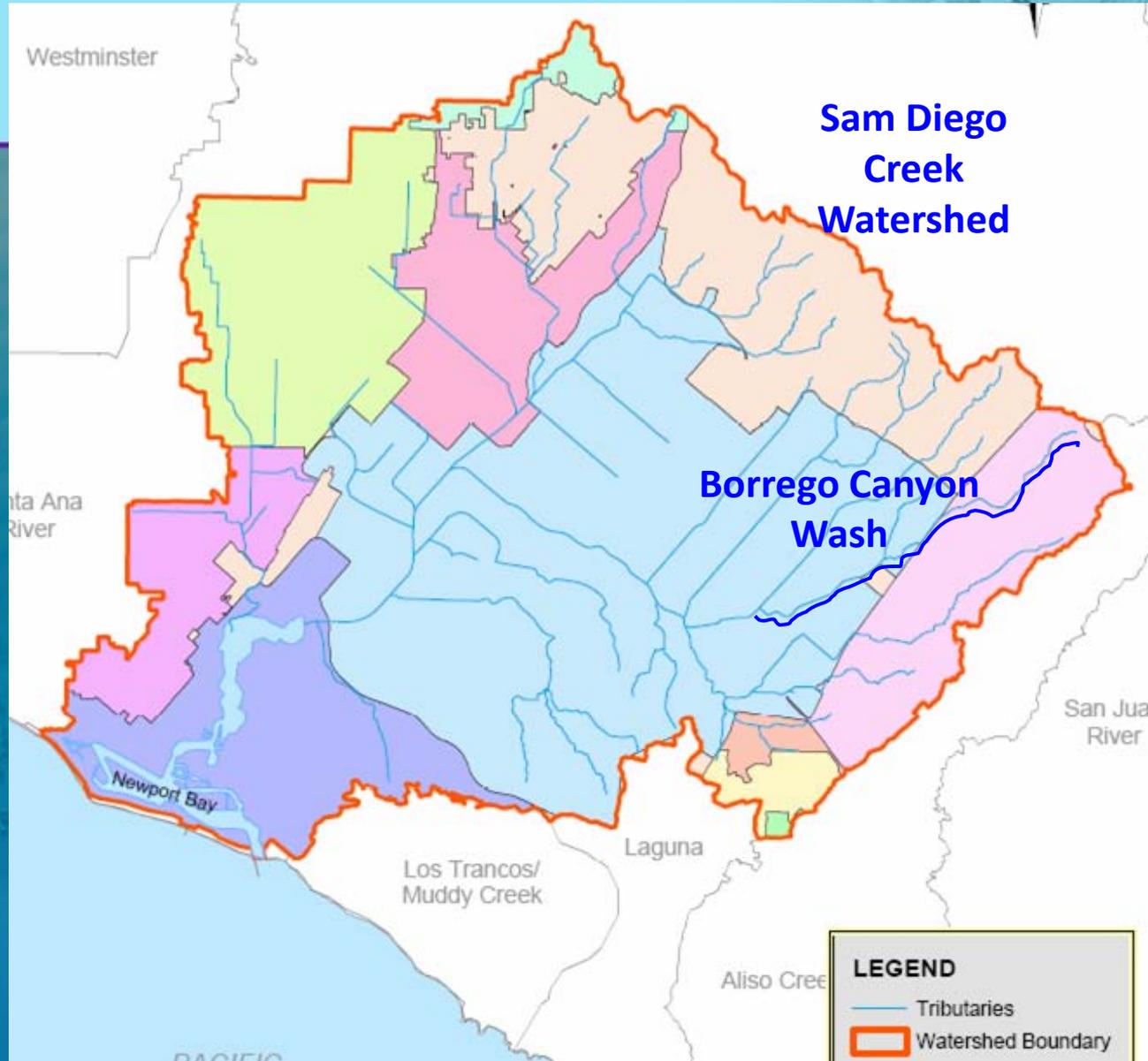


# San Diego Creek / Newport Bay Watershed



- Located within Orange County, CA
  - 11 cities + County
- 154 total square miles
  - 118 square miles – SDC watershed
- Three main geographical areas
- Watershed drains into Newport Bay

# Borrego Canyon Wash Watershed



# Newport Bay



- **Upper Newport Bay**
  - State Ecological Reserve
  - Habitat for 200+ species of birds, including endangered light-footed clapper rail & CA least tern
- **Lower Newport Bay**
  - Fully developed and channeled harbor
  - One of largest small craft pleasure harbors in the United States

# History of Sedimentation Problem

1967



1975



1978



- San Diego Creek channeled to UNB in 1965
- Major Floods in 1969 and 1978
- Large amounts of sediment deposited in Upper Newport Bay
- Ecological Reserve adversely affected

# Regional Watershed Setting

Upstream Limit

Downstream Limit

Irvine Blvd

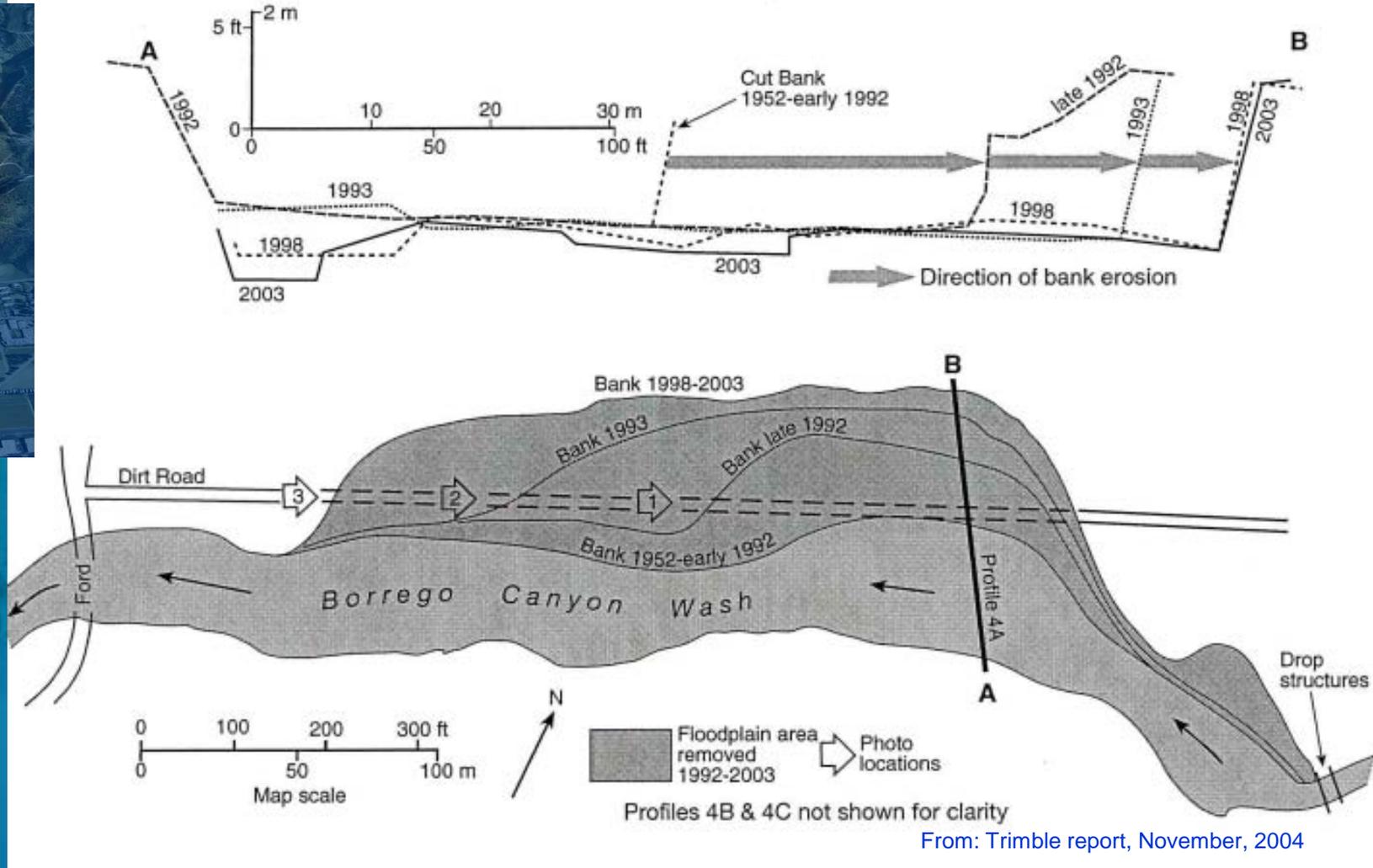


# Previous Channel Erosion Studies

- Channel erosion studies initiated in 1982 by Stanley W. Trimble, UCLA Dept. of Geography
- In 1983, just under 200 cross-sections installed across earthen channels of all sizes and types and surveyed
- Surveyed annually – new profiles added/subtracted
- By 1993, results showed that channel erosion furnished more than 50% of sediment yield from San Diego Creek



# Lateral Bank Migration 1952 - 2003



From: Trimble report, November, 2004





# Preliminary Stabilization Design

## BORREGO WASH CREEK STABILIZATION PRELIMINARY DESIGN ALTERNATIVES

FROM: IRVINE BLVD. TO: BAKER RANCH / FOOTHILL RANCH BOUNDARY

DECEMBER 2009

### INDEX OF SHEETS

- 1 TITLE SHEET
- 2 PLAN AND PROFILE STA. 15+00.00 TO STA. 35+80.00
- 3 PLAN AND PROFILE STA. 35+80.00 TO STA. 55+80.00
- 3A PLAN AND PROFILE STA. 35+80.00 TO STA. 55+80.00 - SEDIMENT BASIN ALTERNATIVE
- 3B SITE PHOTOS STA. 35+80.00 TO STA. 55+80.00
- 4 PLAN AND PROFILE STA. 55+80.00 TO STA. 71+80.00
- 4A SITE PHOTOS STA. 55+80.00 TO STA. 71+80.00
- 5 PLAN AND PROFILE STA. 71+80.00 TO STA. 84+80.00
- 5A SITE PHOTOS STA. 71+80.00 TO STA. 84+80.00
- 6 PLAN AND PROFILE STA. 84+80.00 TO STA. 99+00.00
- 6A PLAN AND PROFILE STA. 84+80.00 TO STA. 99+00.00 - ALTERNATIVE 6.1
- 6B SITE PHOTOS STA. 84+80.00 TO STA. 99+00.00
- 7 PLAN AND PROFILE STA. 99+00.00 TO STA. 112+00.00
- 7A PLAN AND PROFILE STA. 99+00.00 TO STA. 112+00.00 - ALTERNATIVE 6.1
- 7B SITE PHOTOS STA. 99+00.00 TO STA. 112+00.00
- 8 PLAN AND PROFILE STA. 112+00.00 TO STA. 127+00.00
- 8A PLAN AND PROFILE STA. 112+00.00 TO STA. 127+00.00 - ALTERNATIVES 7.1 AND 8.1
- 8B SITE PHOTOS STA. 112+00.00 TO STA. 127+00.00
- 9 CREEK STABILIZATION DETAILS
- 10 CREEK STABILIZATION PHOTOS

### PREPARED BY

PREPARED UNDER RESPONSIBLE CHARGE OF:

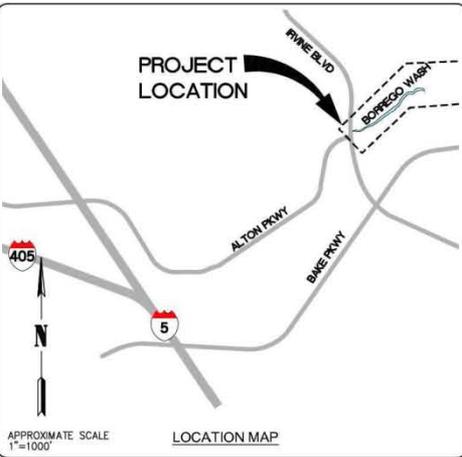


17520 Newhouse Street, Suite 205 | Fountain Valley, CA 92708  
P: (714) 481-7300 | www.pacewater.com

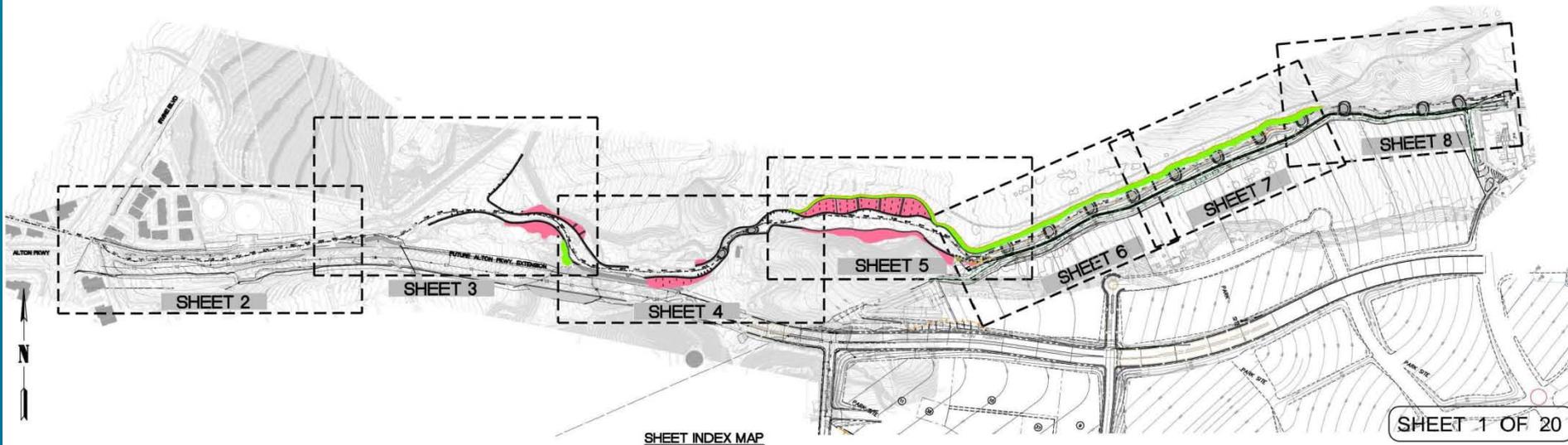


BRUCE M. PHILLIPS, P.E.  
R.C.E. NO. 38635

DATE



PREPARED FOR



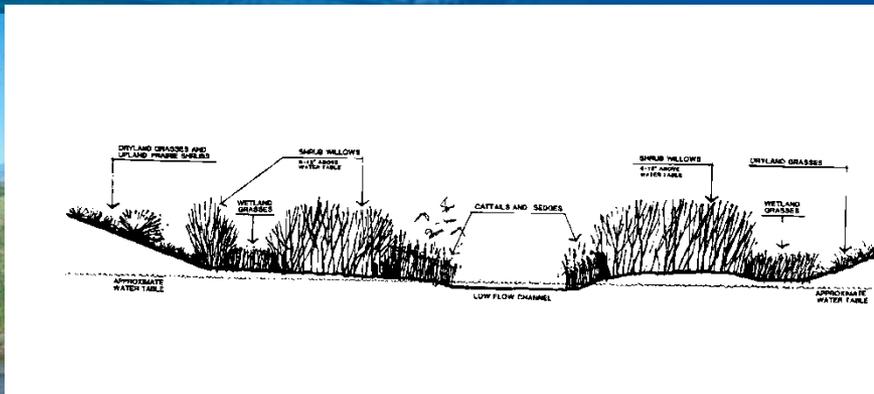
# Water Quality Benefits

- Reduction of sediment downstream to UNB
- Removing major source of sediment making it difficult to achieve sediment TMDL
- Improving the water quality downstream San Diego Creek Channels
- Reducing sediment deposition in downstream habitat and sediment basins
- Intercepting urban dry-weather flows for restored vegetative corridor



# Watershed Habitat Restoration

- Restoration of vegetative habitat corridor
- Creation of new habitat features within the adjacent floodplain
- Stabilization / protection of vegetation from erosion
- Connecting regional wildlife corridor to proposed Great Park Wildlife Corridor
- Creation of approximately 50 acres of new habitat



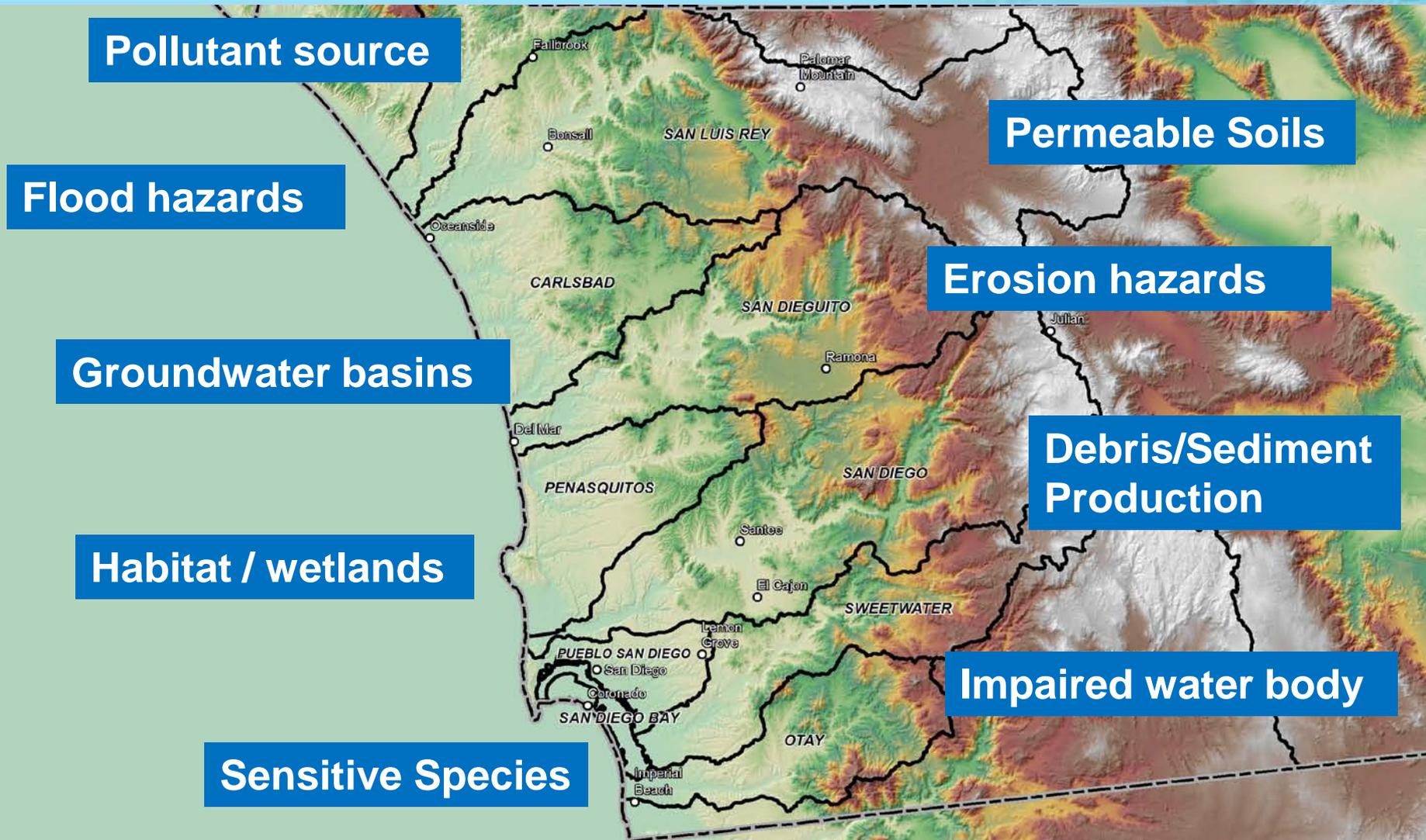


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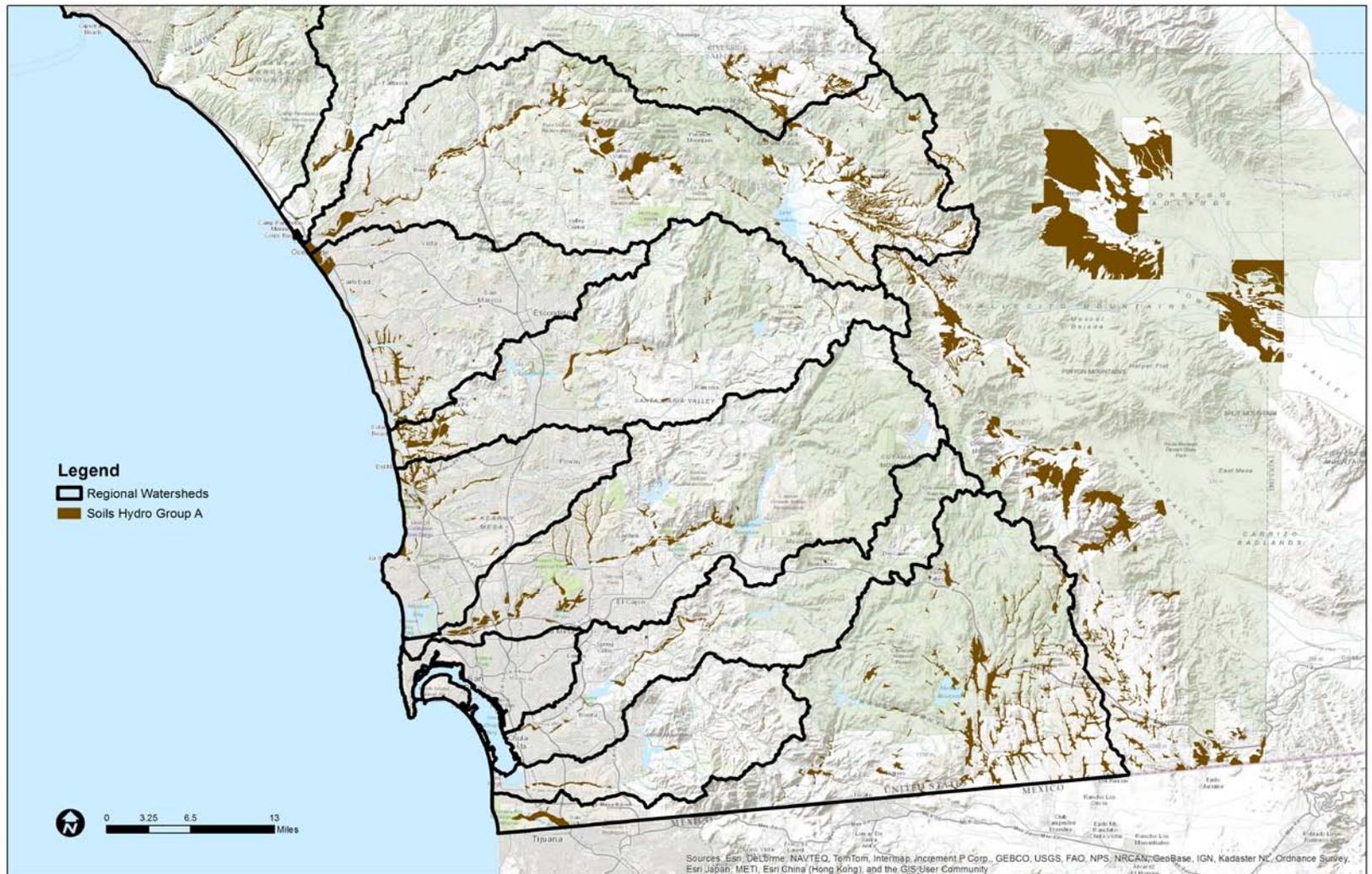
# IFM Watershed Opportunities Planningg



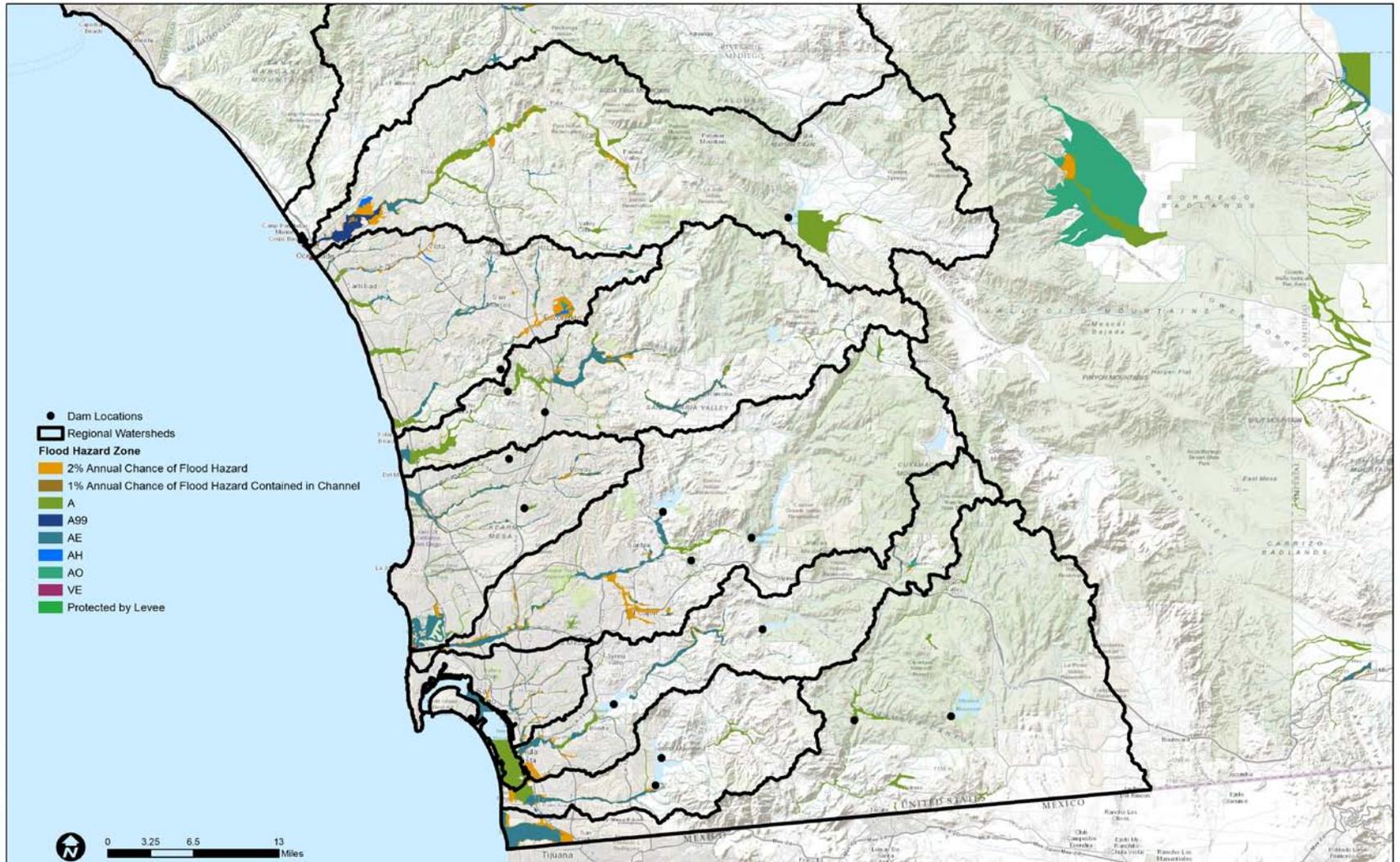
# Watershed Mapping Databases Foundation for IFM Planning



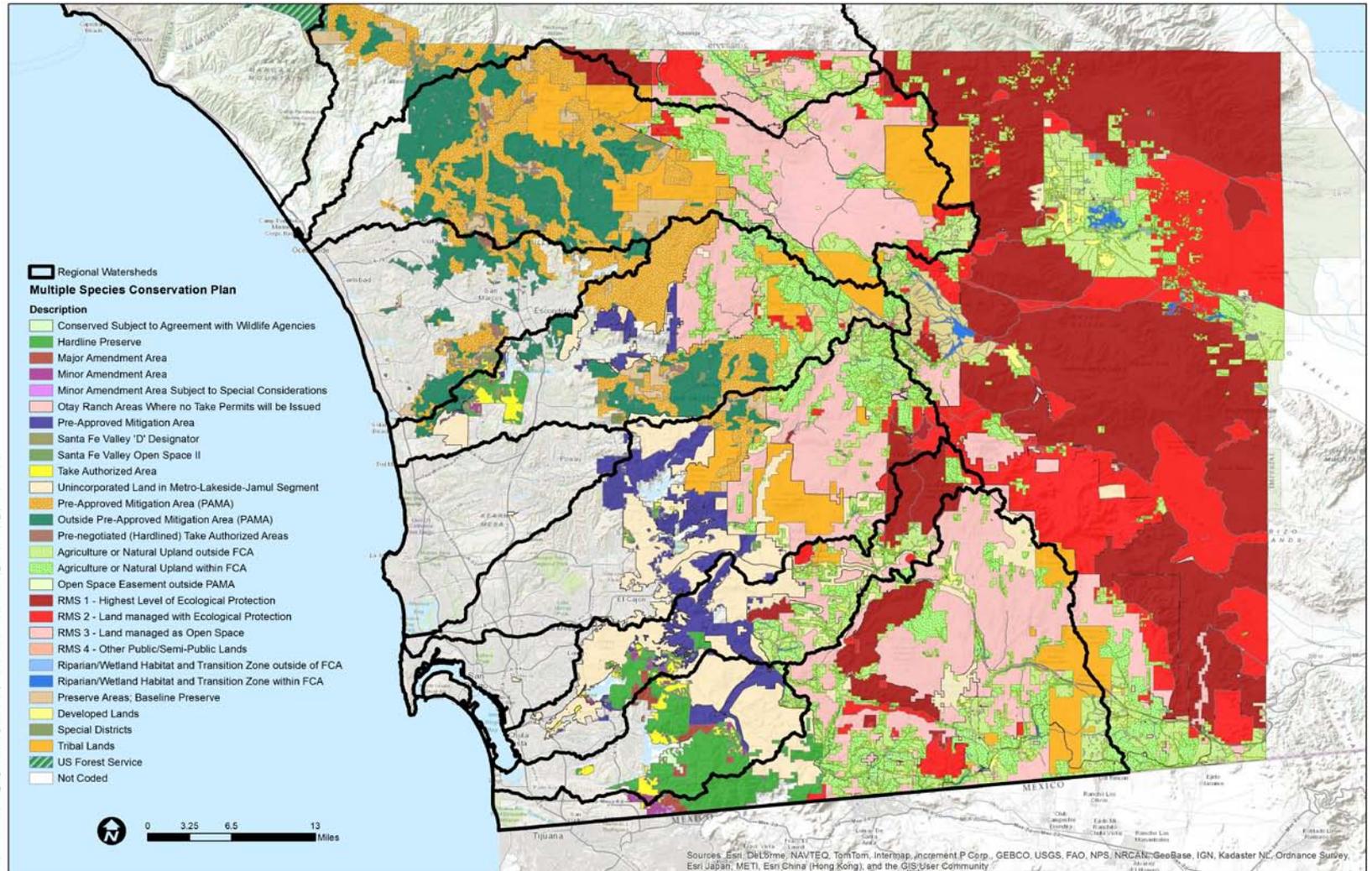
# Permeable Hydrologic Soil Type



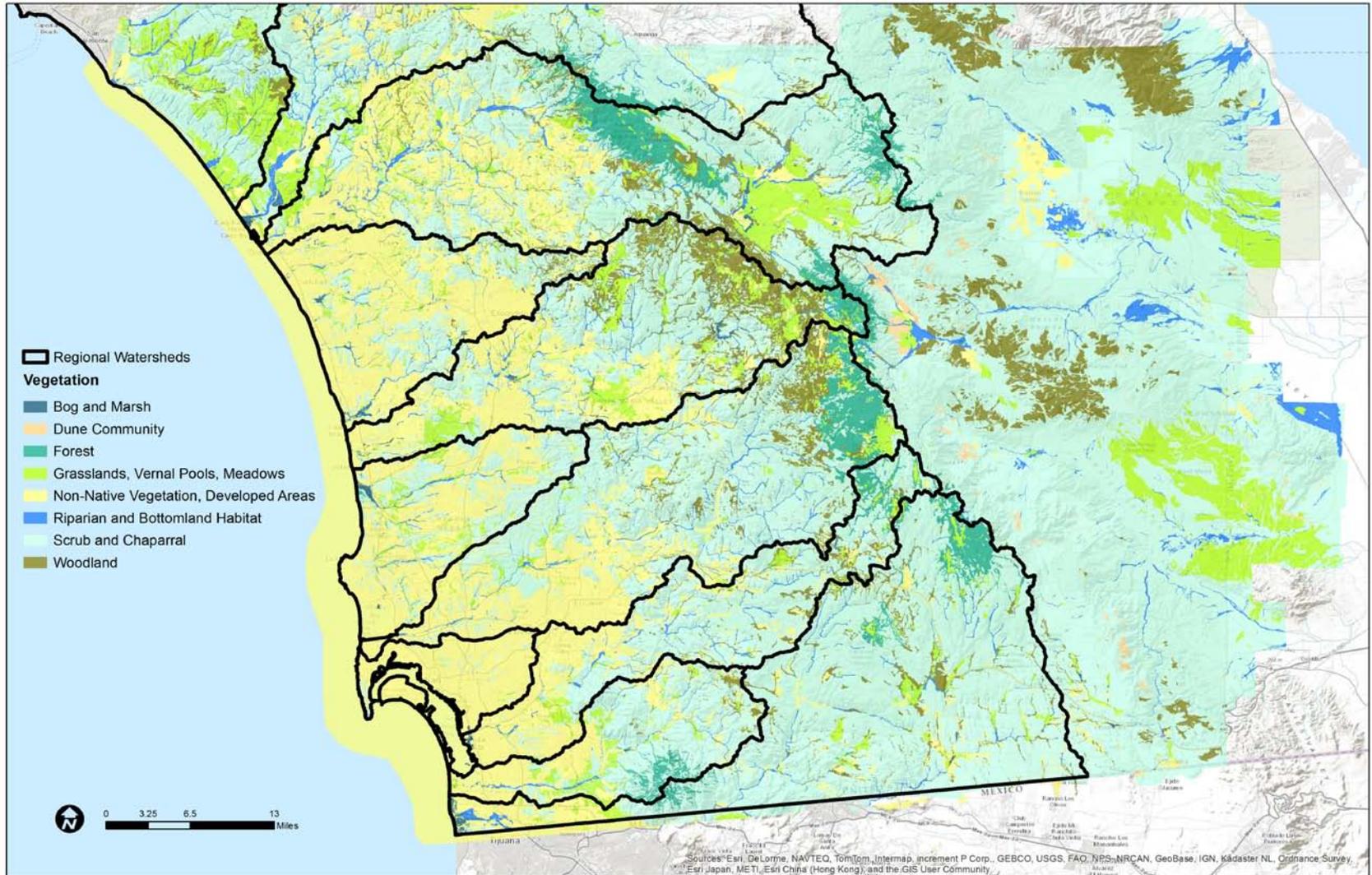
# Flood Hazard Types and Locations



# MSHCP Conservation Areas

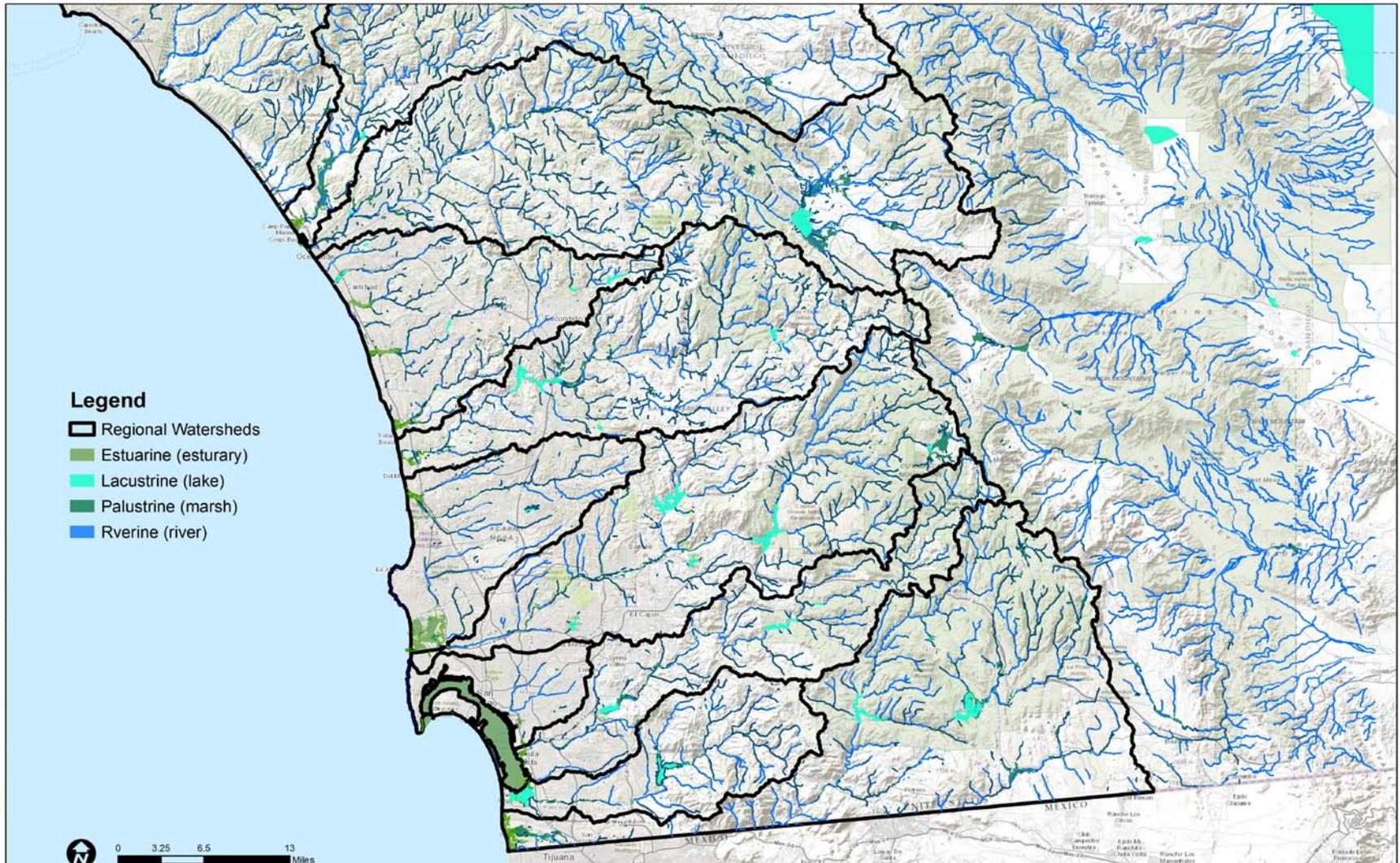


# Vegetation Types

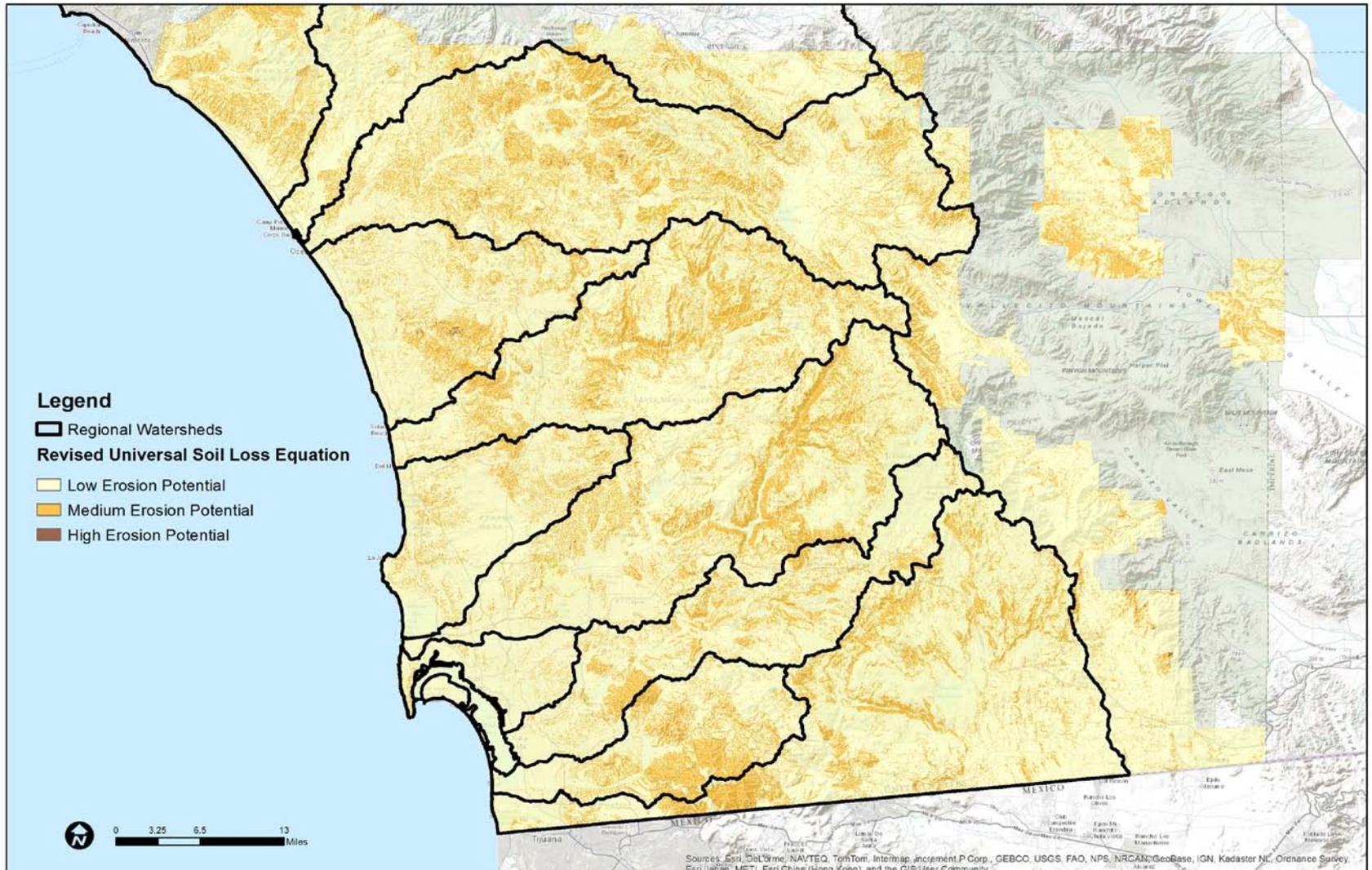




# Wetland Vegetation



# High Watershed Erosion / Sediment Production





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# GIS Watershed IFM Planning Tool

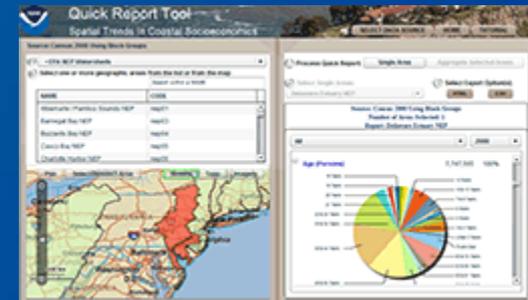
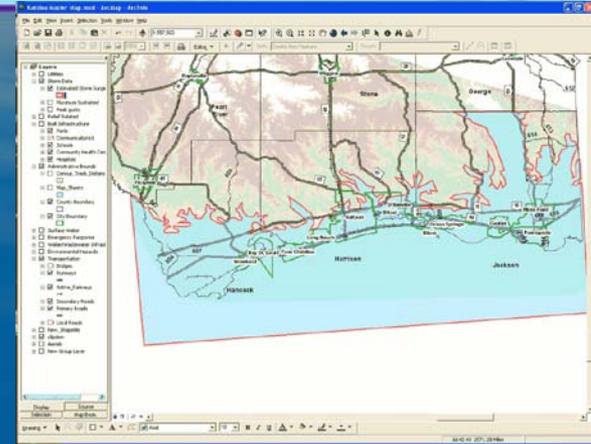


# Watershed IFM Planning Tool

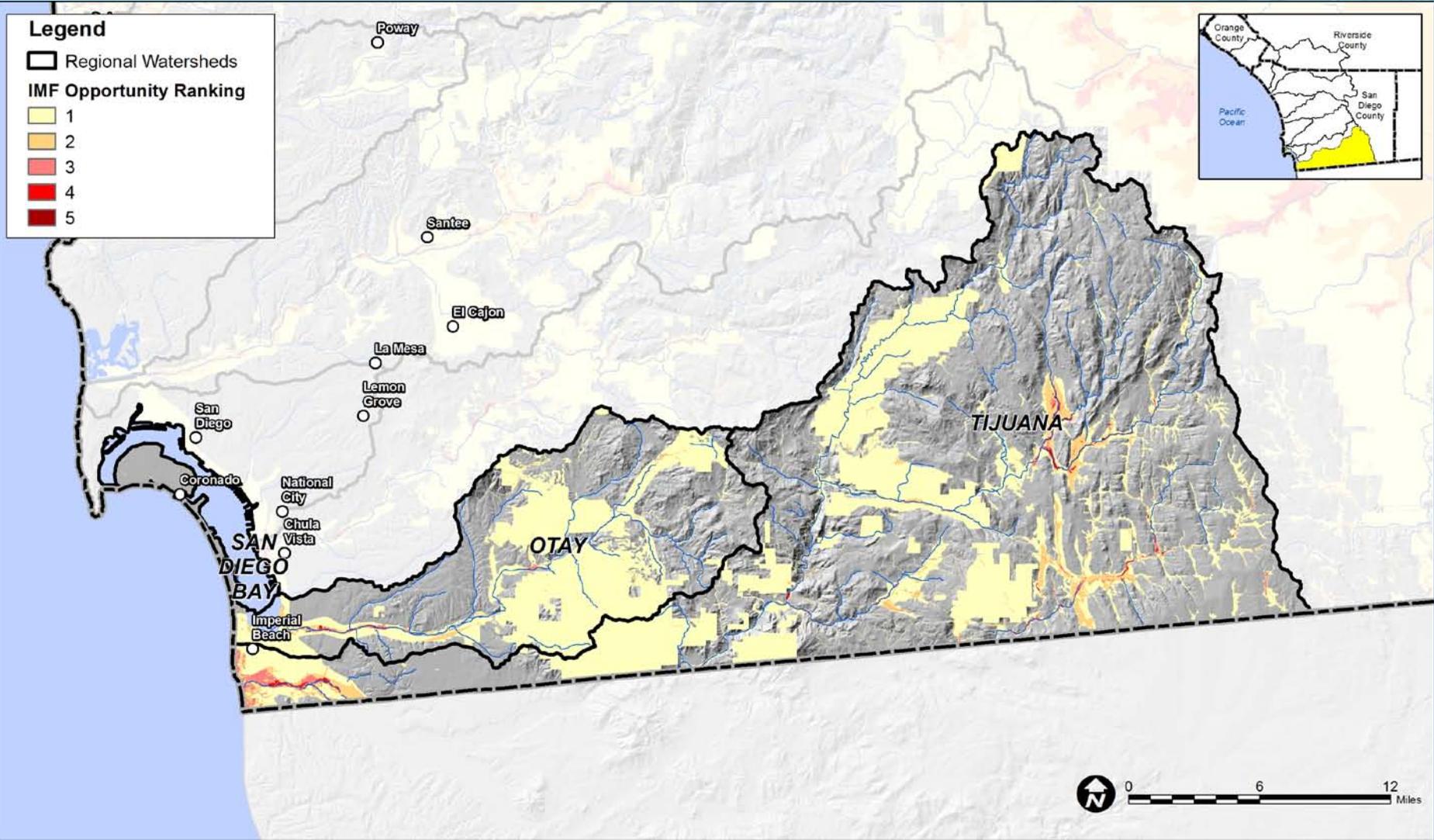
## Defining Opportunities:

- Landuse planning
- Groundwater Recharge
- Habitat Protection / Restoration
- Sediment Control
- Water quality improvement

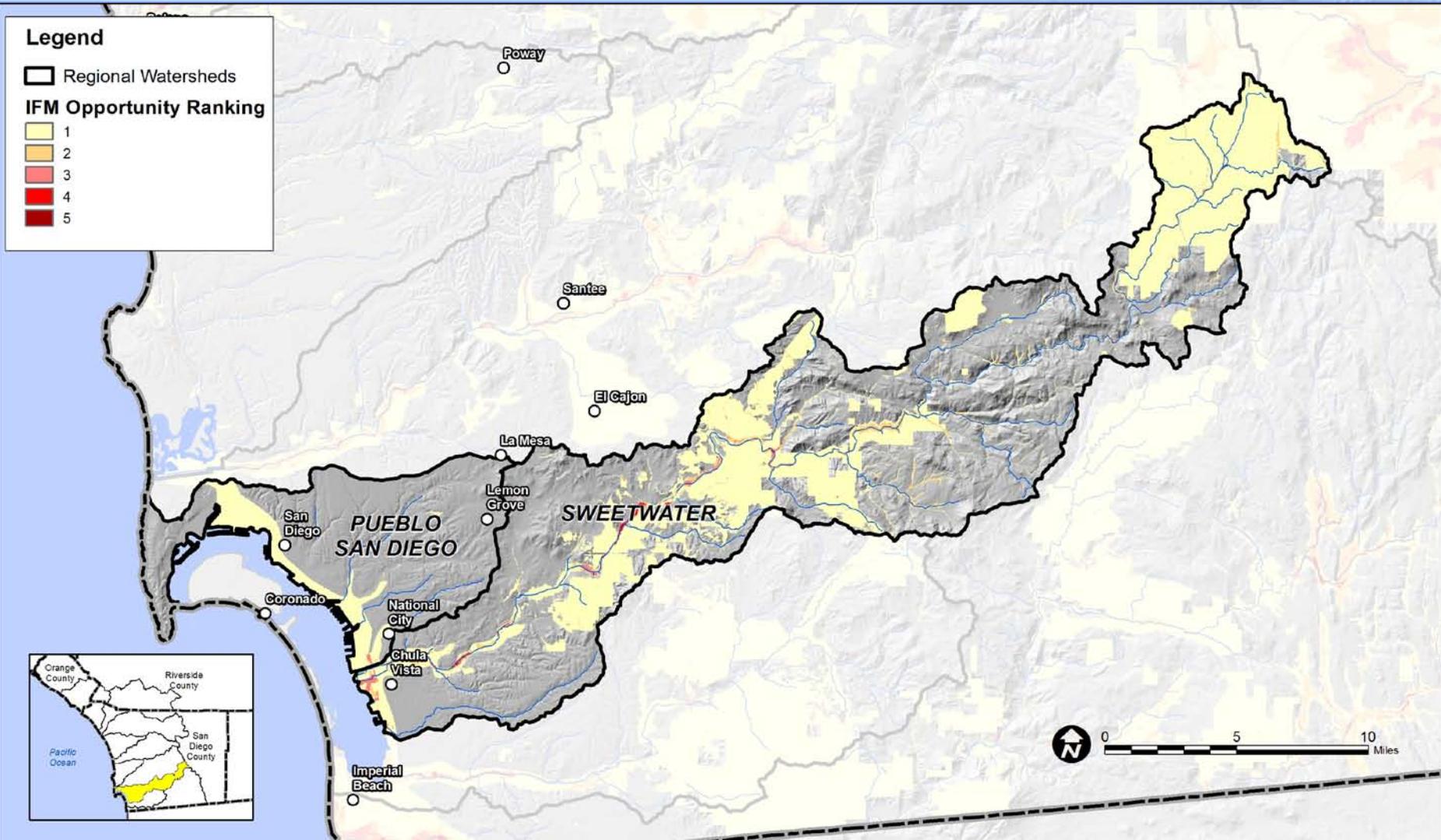
## Define IFM Watershed Planning Principles



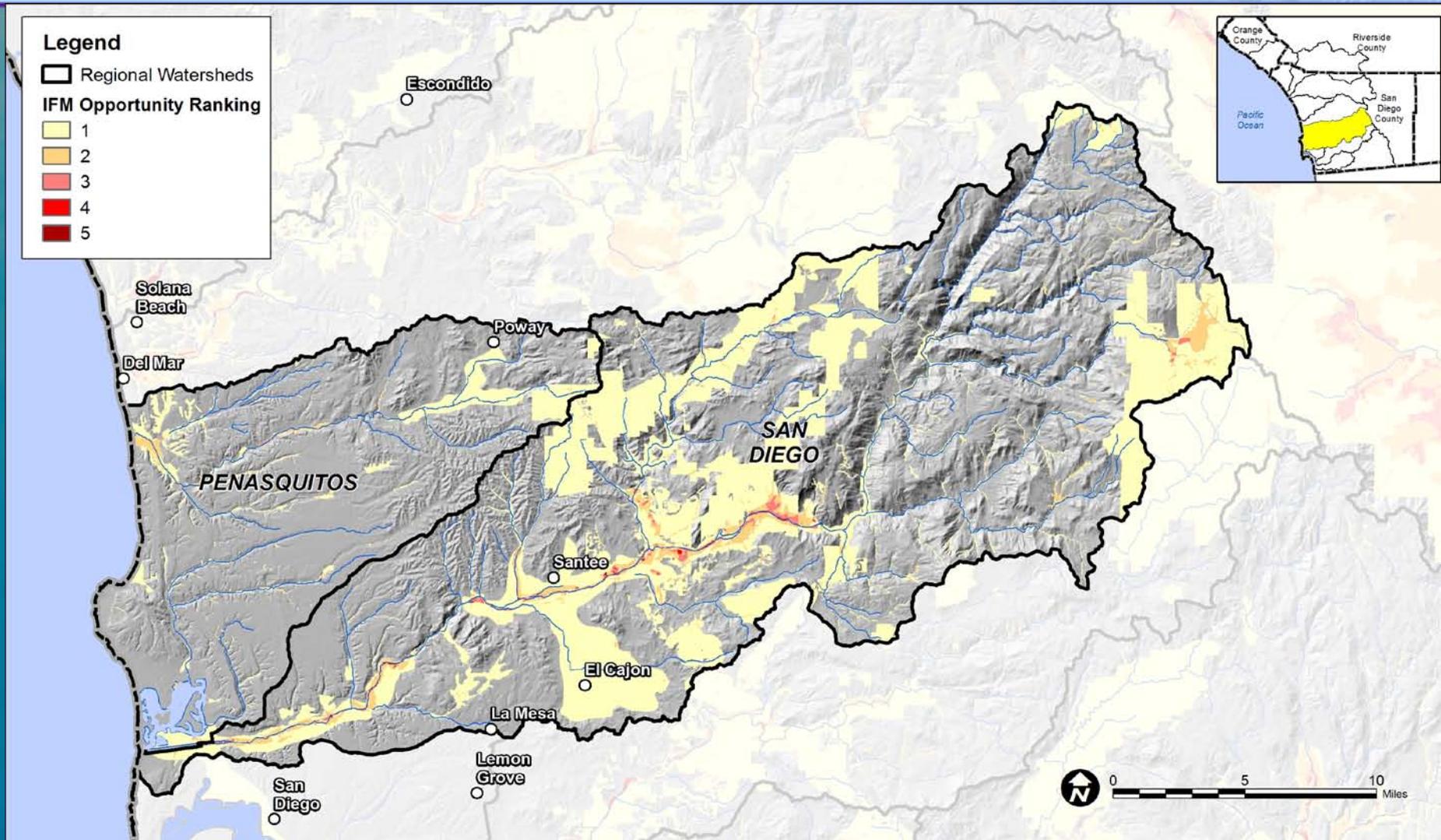
# IFM Opportunity Planning Tool – Otay / Tijuana



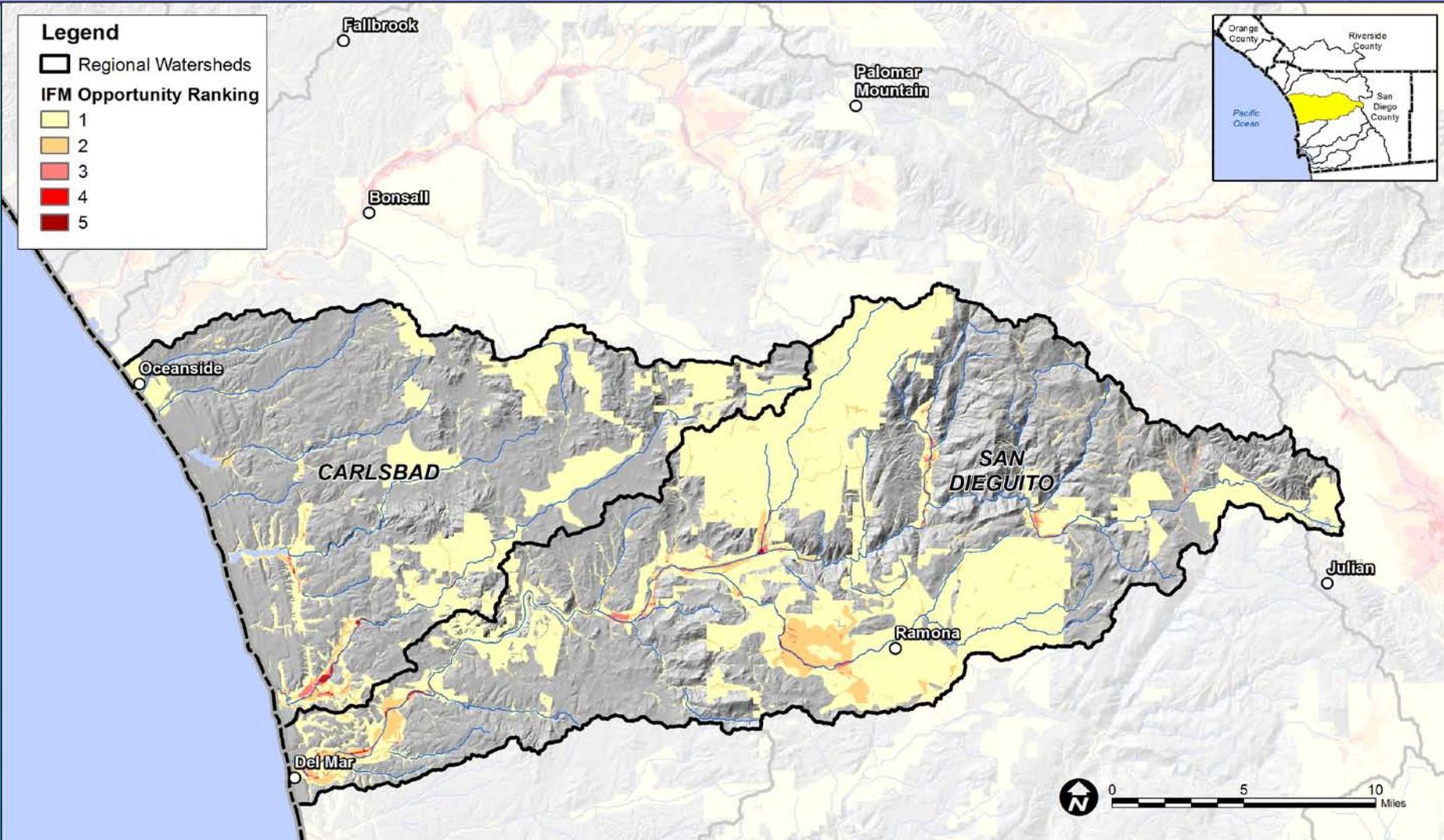
# IFM Opportunity Planning Tool – Downtown SD/ Sweetwater



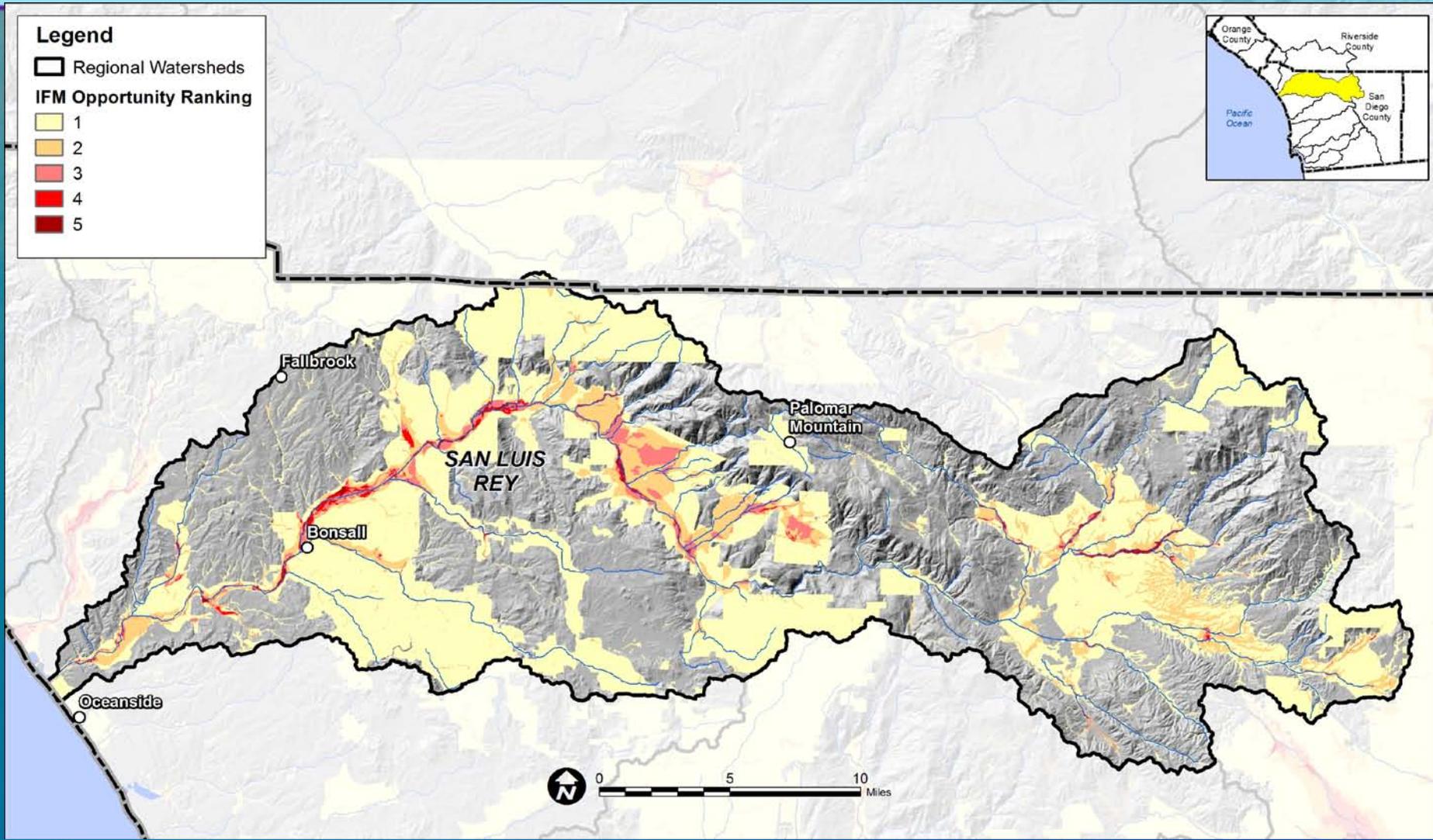
# IFM Opportunity Planning Tool – Penasquitos / San Diego



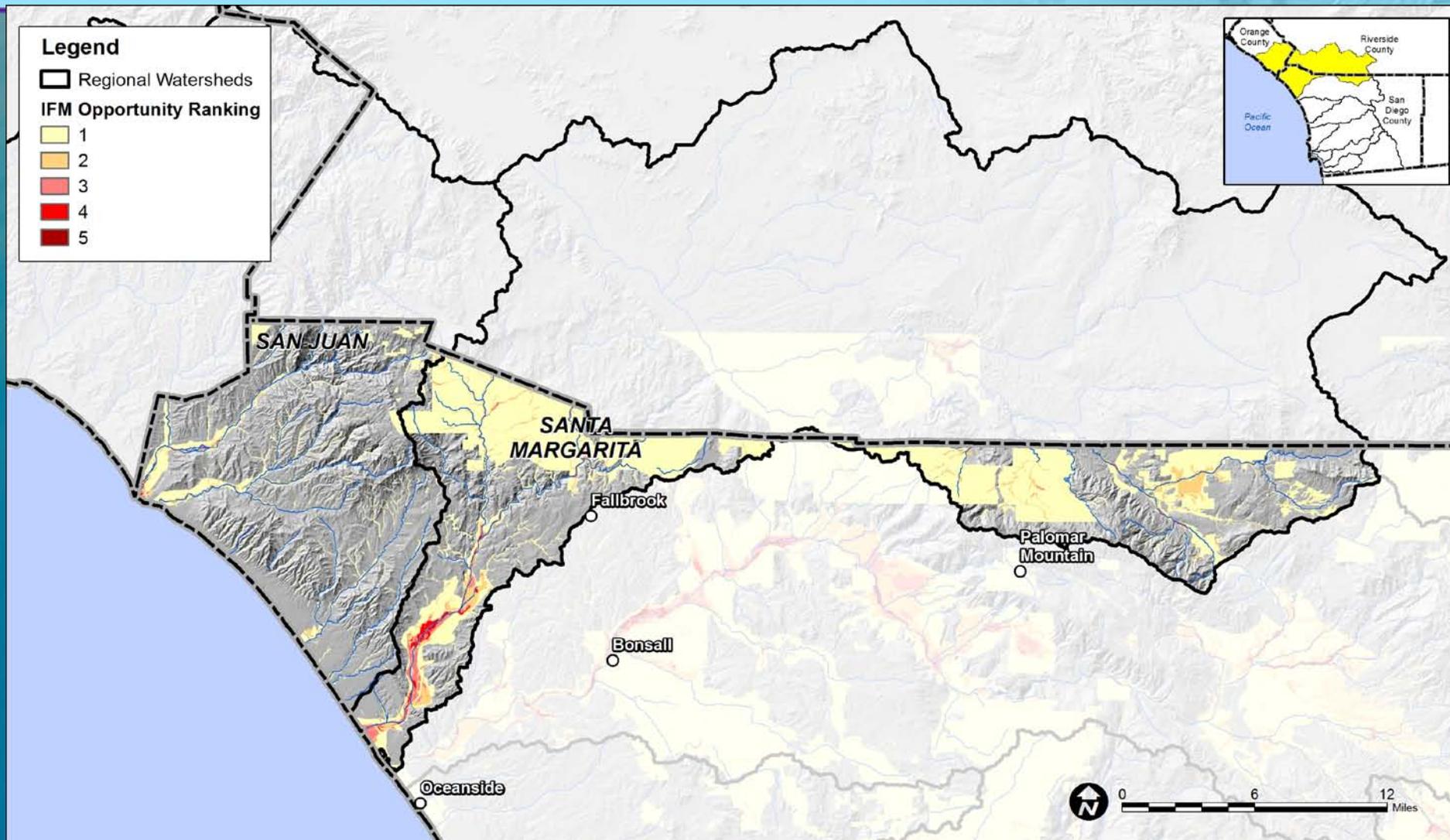
# IFM Opportunity Planning Tool – Carlsbad/San Dieguito



# IFM Opportunity Planning Tool – San Luis Rey



# IFM Opportunity Planning Tool – San Juan / Santa Margarita





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# Stakeholder Input - Assignment



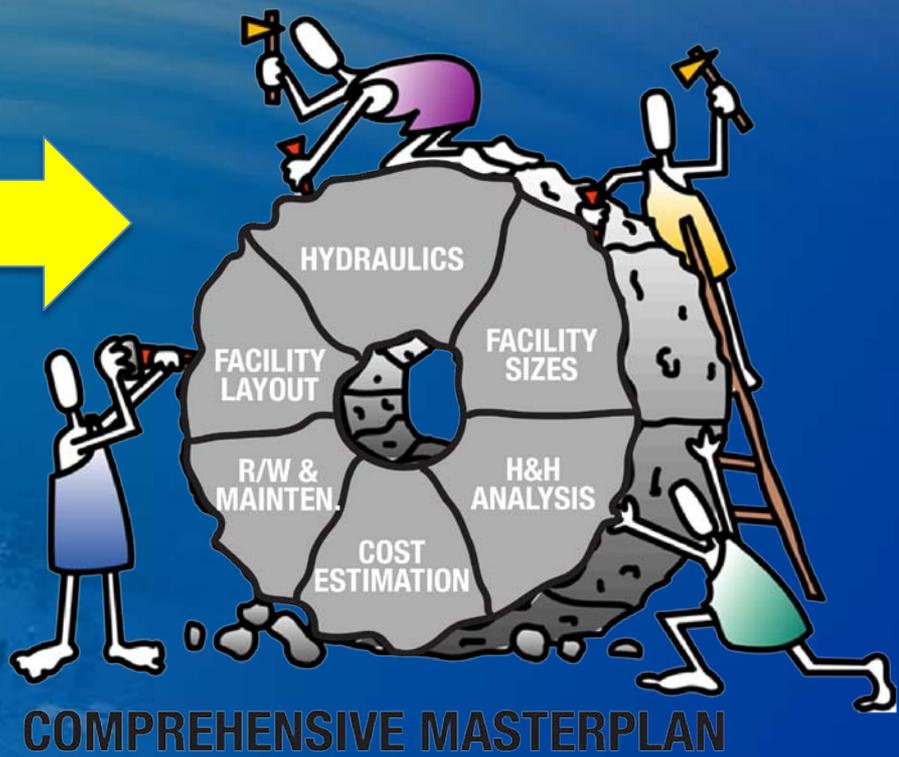
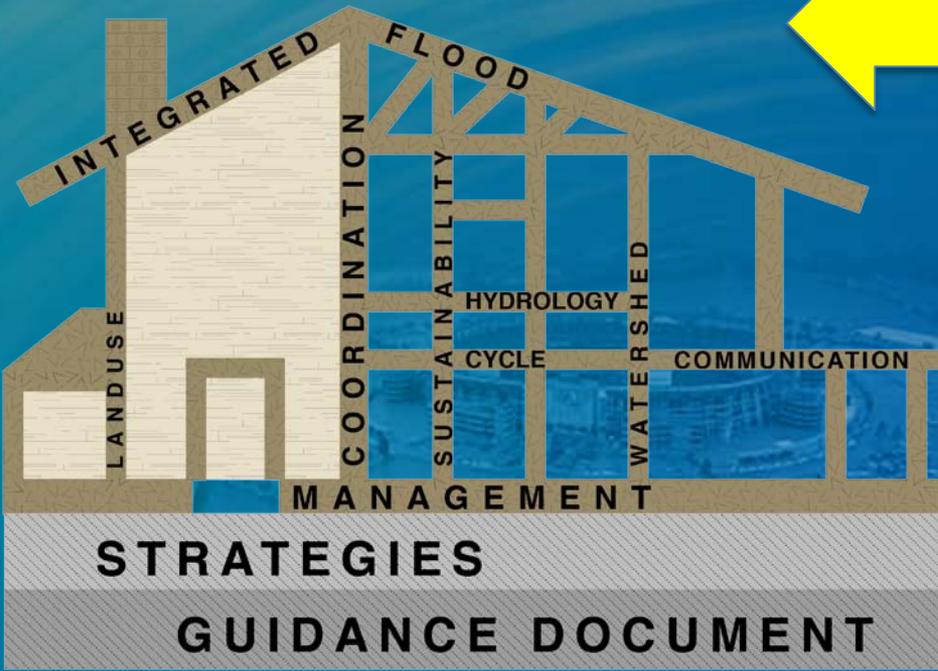
# Stakeholders Assignment / Input

## Additional Data

- Chronic flood and deficiency locations
- Characterize common flood problems
- Flood problem sources



# Goal - Framework IFM Watershed Strategies to Develop Projects



# UPDATING THE SAN DIEGO IRWM TO ADDRESS INTEGRATED FLOOD MANAGEMENT

## WORKSHOP NO. 2



 **SAN DIEGO**  
**Integrated Regional  
Water Management**

PRESENTED BY:  
BRUCE M. PHILLIPS, MS, PE  
DECEMBER 4, 2012