UCLA
Institute of the Environment and Sustainability

Solving the Puzzle of Local Water Supply in Los Angeles

UCLA: Erik Porse PhD, Kathryn Mika PhD, Kartiki Naik PhD, Madelyn Glickfeld, Mark Gold D.Env, Stephanie Pincetl PhD

Colorado School of Mines: Kimberly Manago, PhD, Terri Hogue, PhD

University of Utah: Elizaveta Litvak PhD, Diane Pataki PhD

CCSC at UCLA

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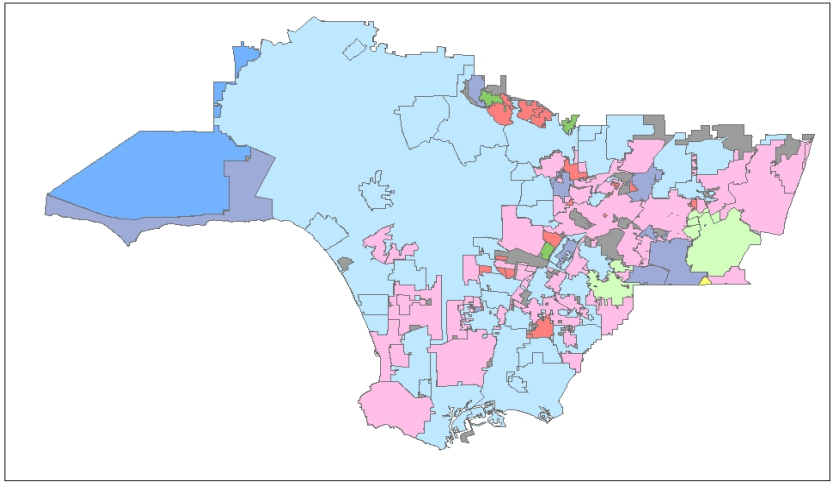
The Urban Water System of L.A.

200+ private and public retailers
5 Municipal Water Districts
3 Water Import Agencies, 1 Replenishment District
7 Watermasters in 15 “adjudicated” groundwater areas
300+ groundwater rights holders
10 Un-adjudicated Basins & sub-basins
84 stormwater management agencies
5+ agencies for treating wastewater
1 Flood Control District
4+ Federal agencies

Water Retailers in Los Angeles



Potable Water Suppliers

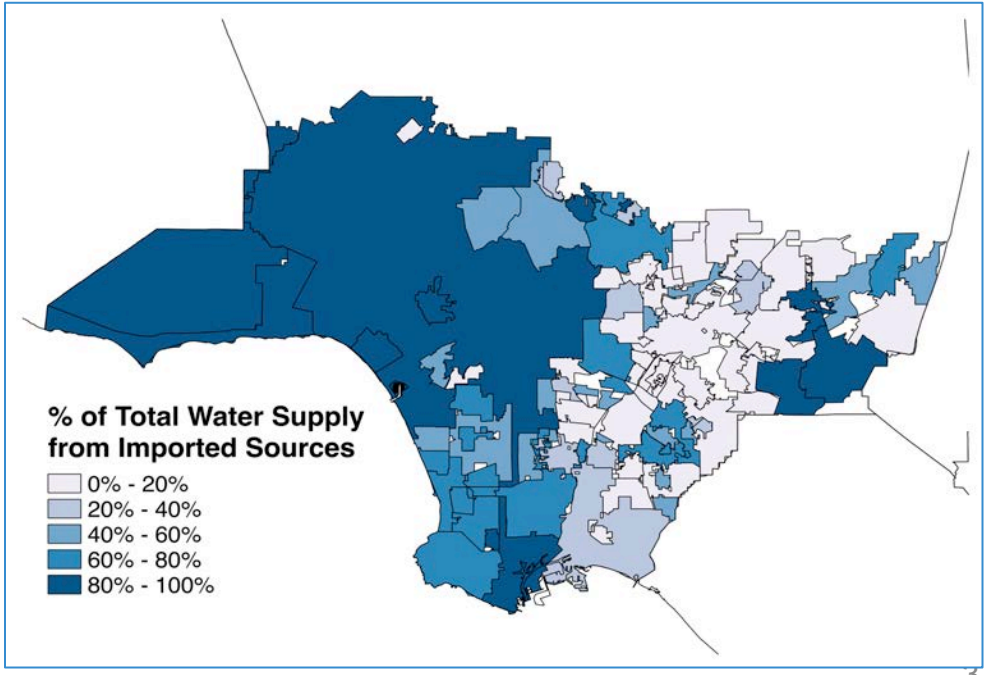
Legend

TYPE

- CITY RETAILER
- COUNTY WATER DISTRICT
- COUNTY WATERWORKS DISTRICT
- CUSTOMER
- INVESTOR OWNED UTILITY
- IRRIGATION DISTRICT
- MUNICIPAL WATER DISTRICT
- MUTUAL WATER COMPANY
- NO DATA

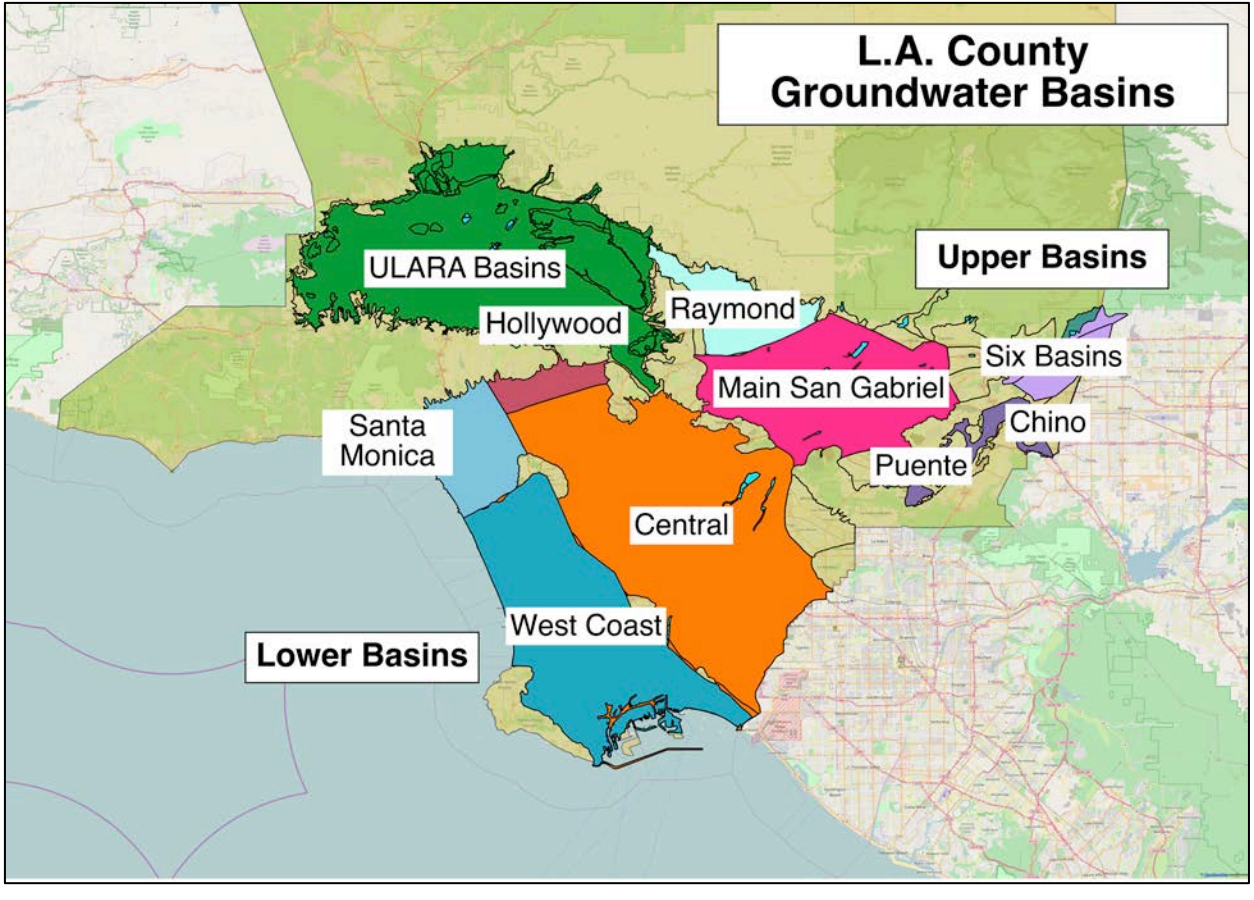
N

0 4 8 16 Miles



Pincetl et al (2016). Fragmented Flows: Water Supply in Los Angeles County. *Environmental Management*. 58.2

Groundwater



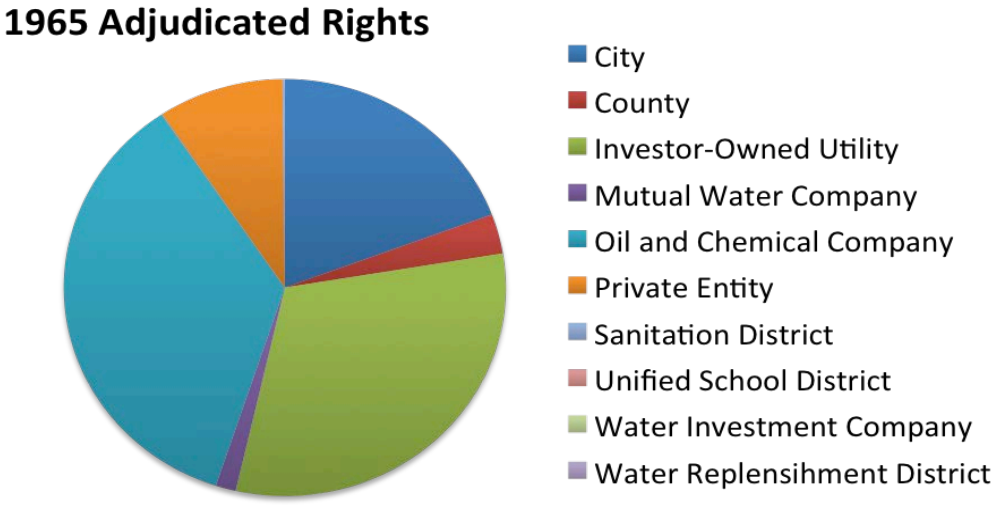
Evolving Groundwater Rights in LA

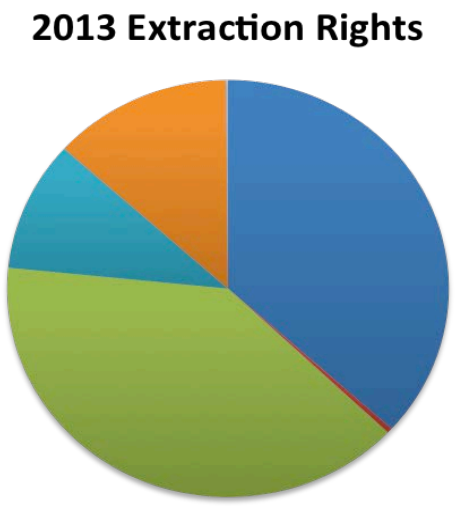
- Well-studied basins in Southern California
  - Elinor Ostrom, Bill Blomquist
- New: Evolving groundwater rights over time
  - Becoming more consolidated, publicly-controlled

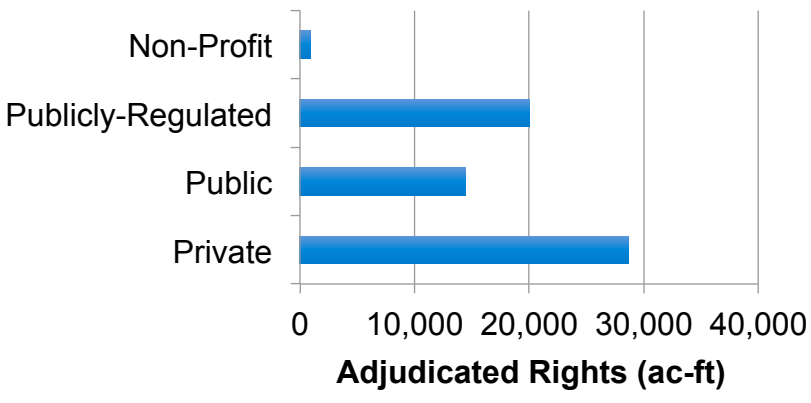
Porse et al (2016). Pumping for the Masses: Evolution of Groundwater Management in Los Angeles. *Geojournal*. 81.5

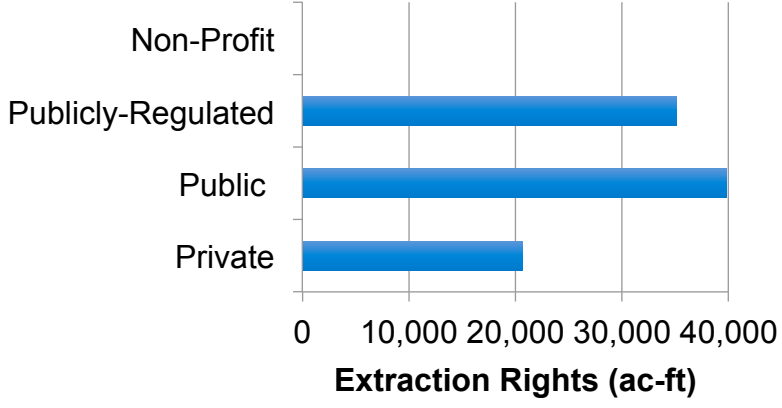
Pumping Rights: More Consolidated & Public

West Coast Basin





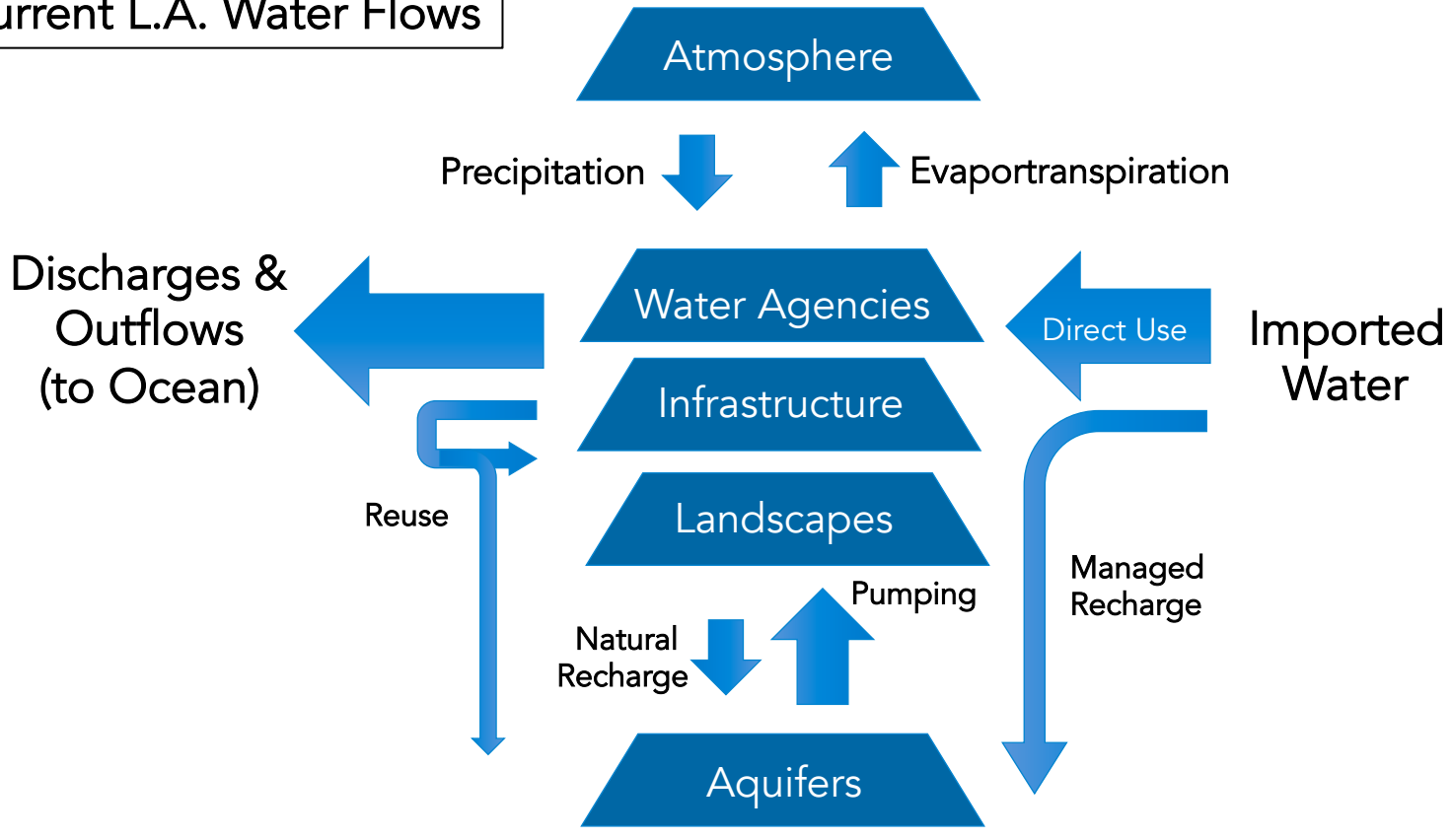




Assembling the Pieces for Local Water Supply in LA

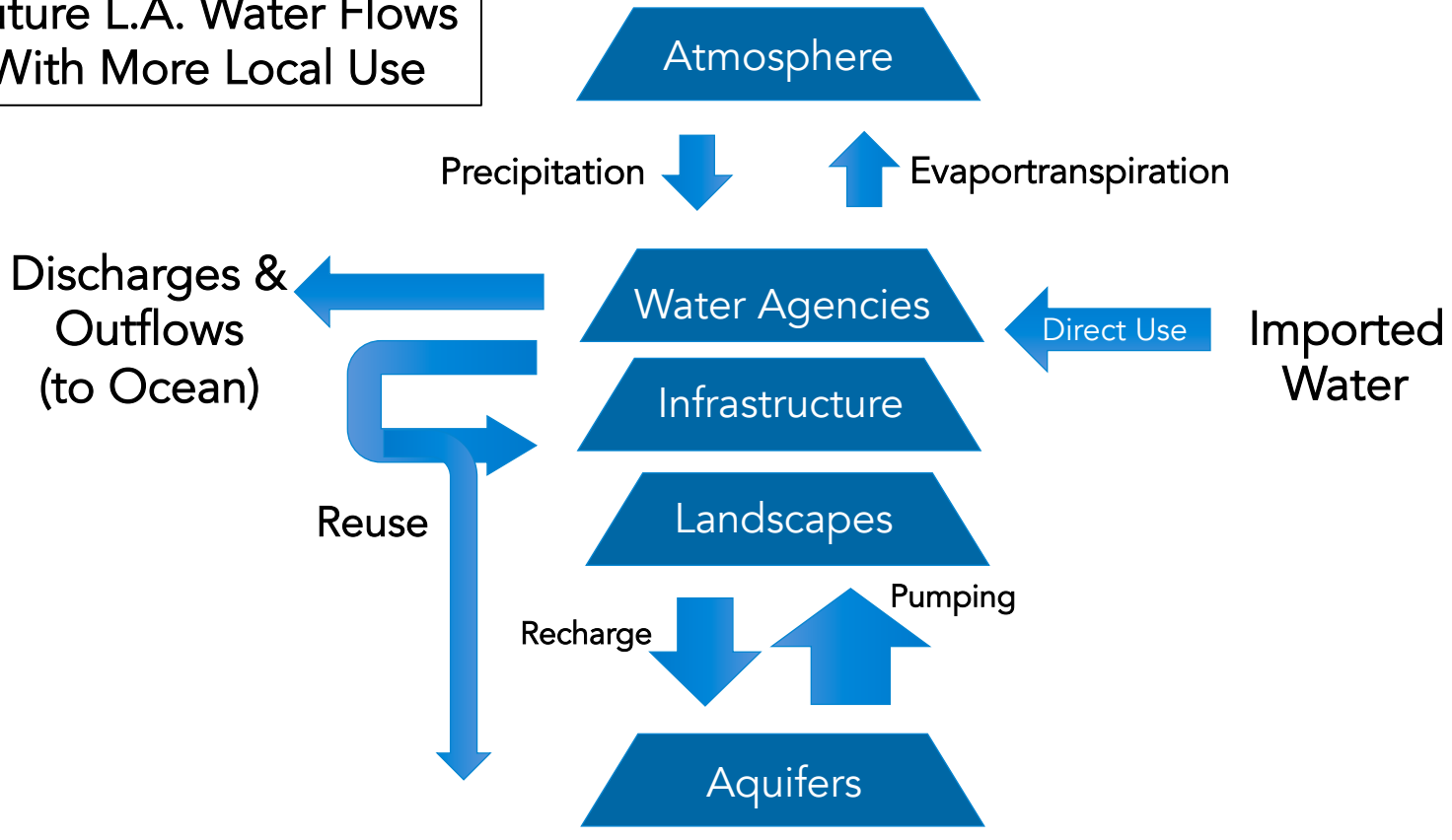
Changing a System

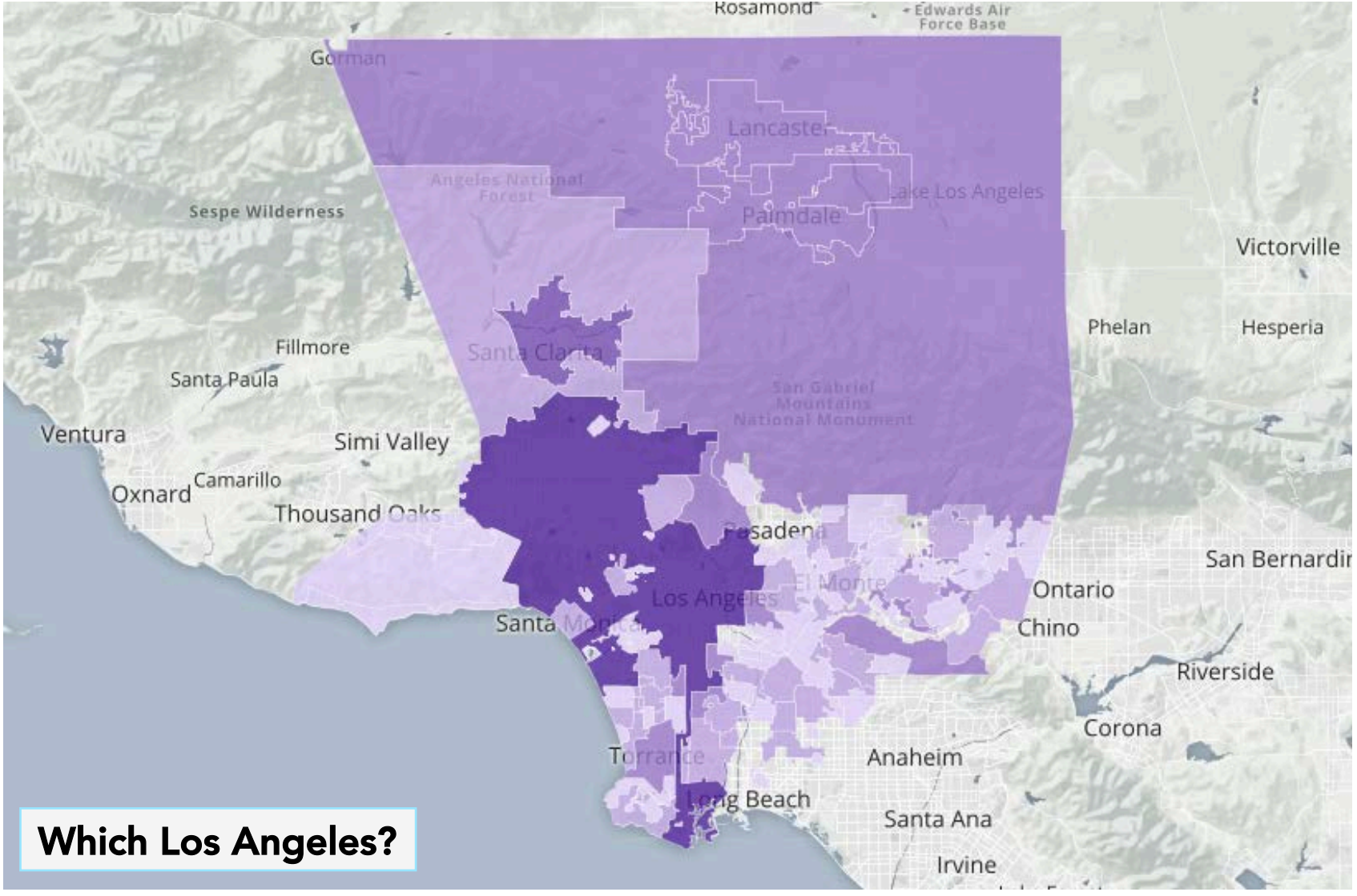
Current L.A. Water Flows



Changing a System

Future L.A. Water Flows With More Local Use



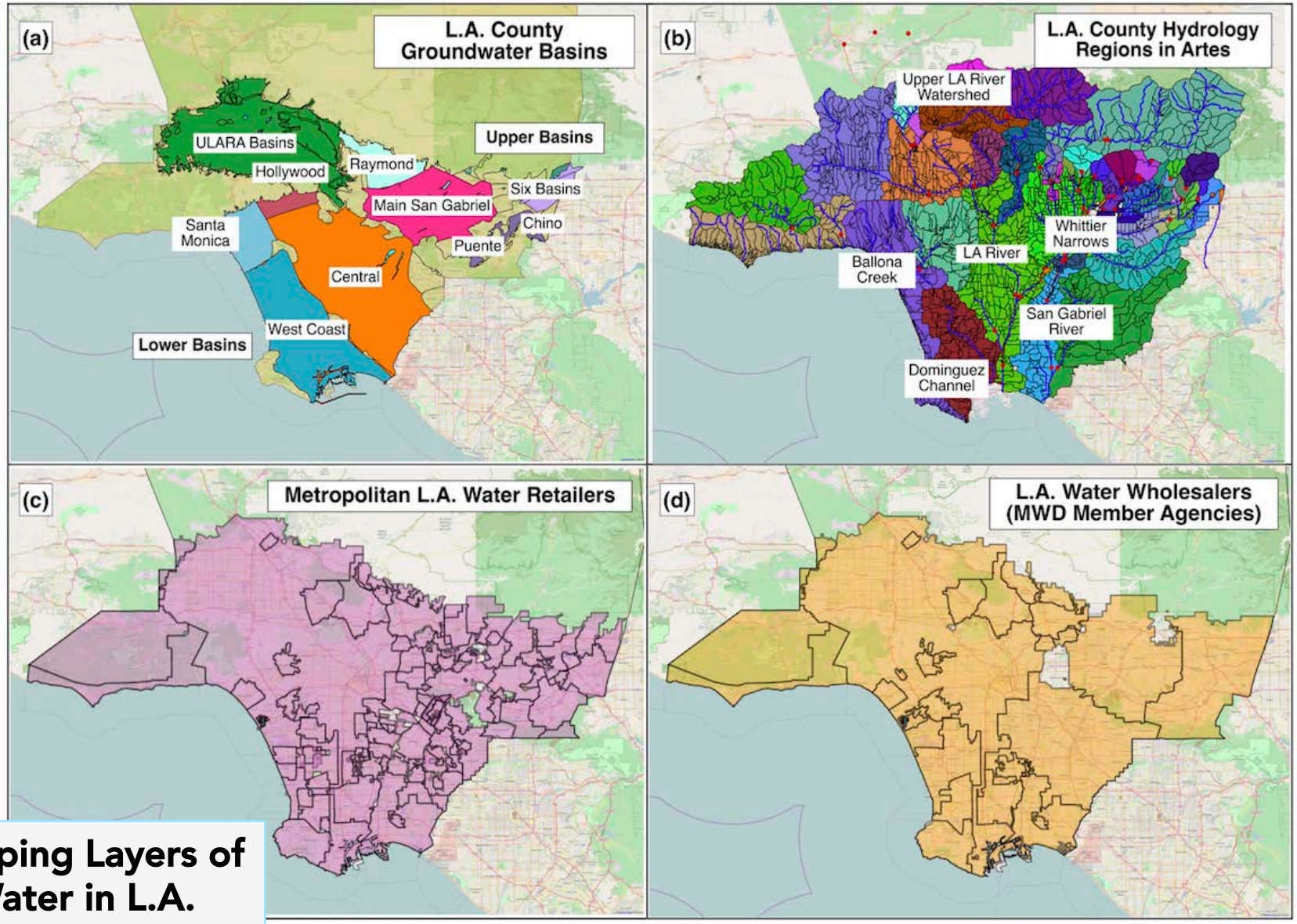

Rosamond
Edwards Air Force Base
Gorman
Lancaster
Angeles National Forest
Sespe Wilderness
Palmdale
Victorville
Phelan
Hesperia
Fillmore
Santa Clarita
Santa Paula
San Gabriel Mountains National Monument
Ventura
Simi Valley
Camarillo
Oxnard
Thousand Oaks
Pasadena
San Bernardino
El Monte
Los Angeles
Ontario
Santa Monica
Chino
Riverside
Corona
Torrance
Anaheim
Long Beach
Santa Ana
Irvine
Which Los Angeles?

Goals of a Systems Model

Assess local water supply potential
given current & future (planned) systems

Develop a *Flexible* and *Adaptable* model that can evolve

Limit assumptions



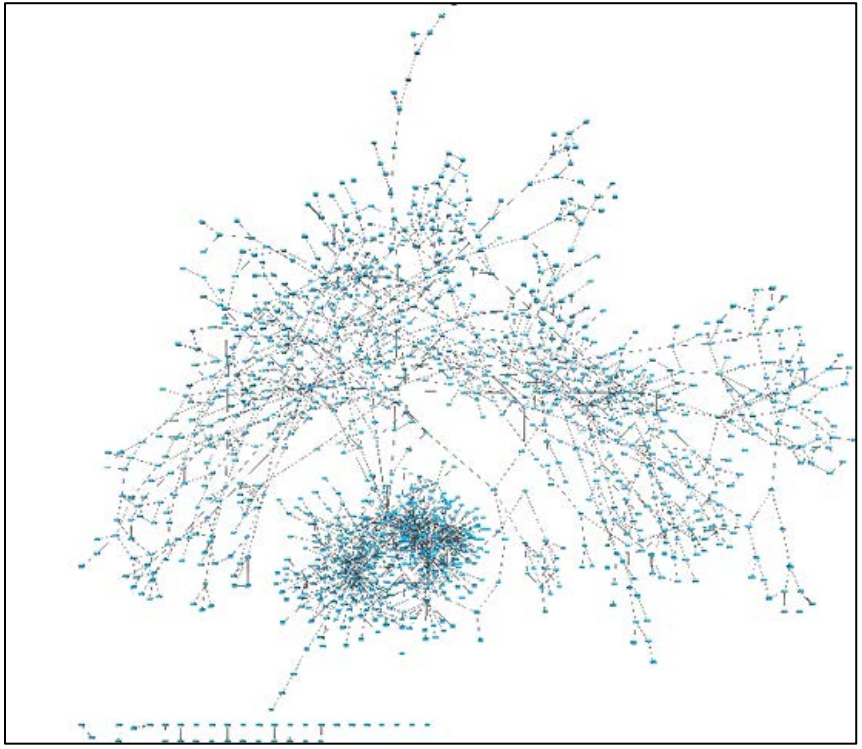
Mapping Layers of Water in L.A.

Artes: A Network Model for L.A. County Water

- Integrated network
  - Water Suppliers (103)
  - Treatment System (17)
  - Surface water zones (46+)
  - Groundwater basins (13)
  - Reservoirs and aqueducts (26)
  - Spreading basins (26)

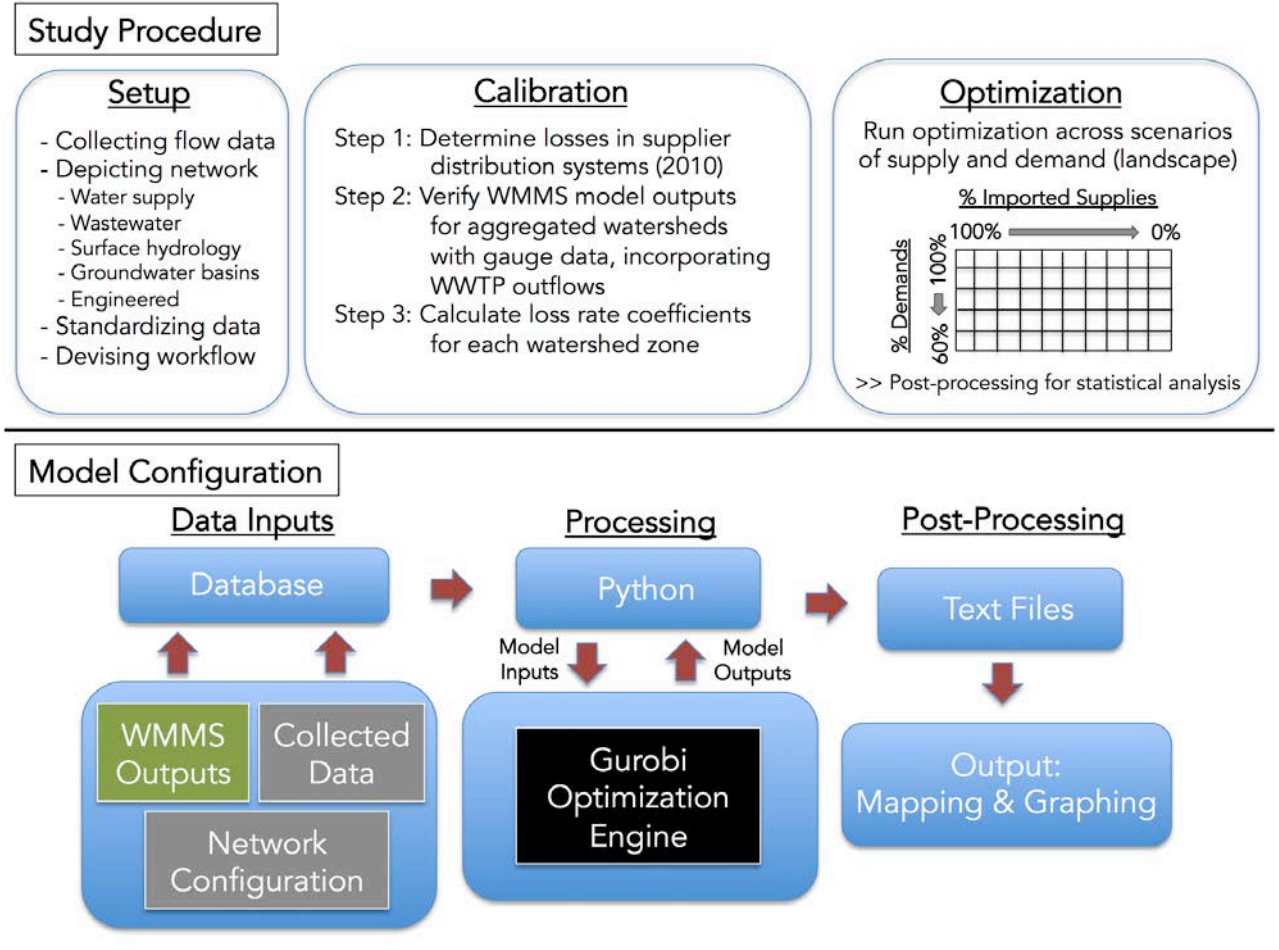
- Database | Python | Gurobi

The L.A. Water Network Modeled in Artes



Porse et al (2017). Systems Analysis and Optimization of Local Water Supplies in Los Angeles. *Journal of Water Resources Planning and Management*. 143(9)

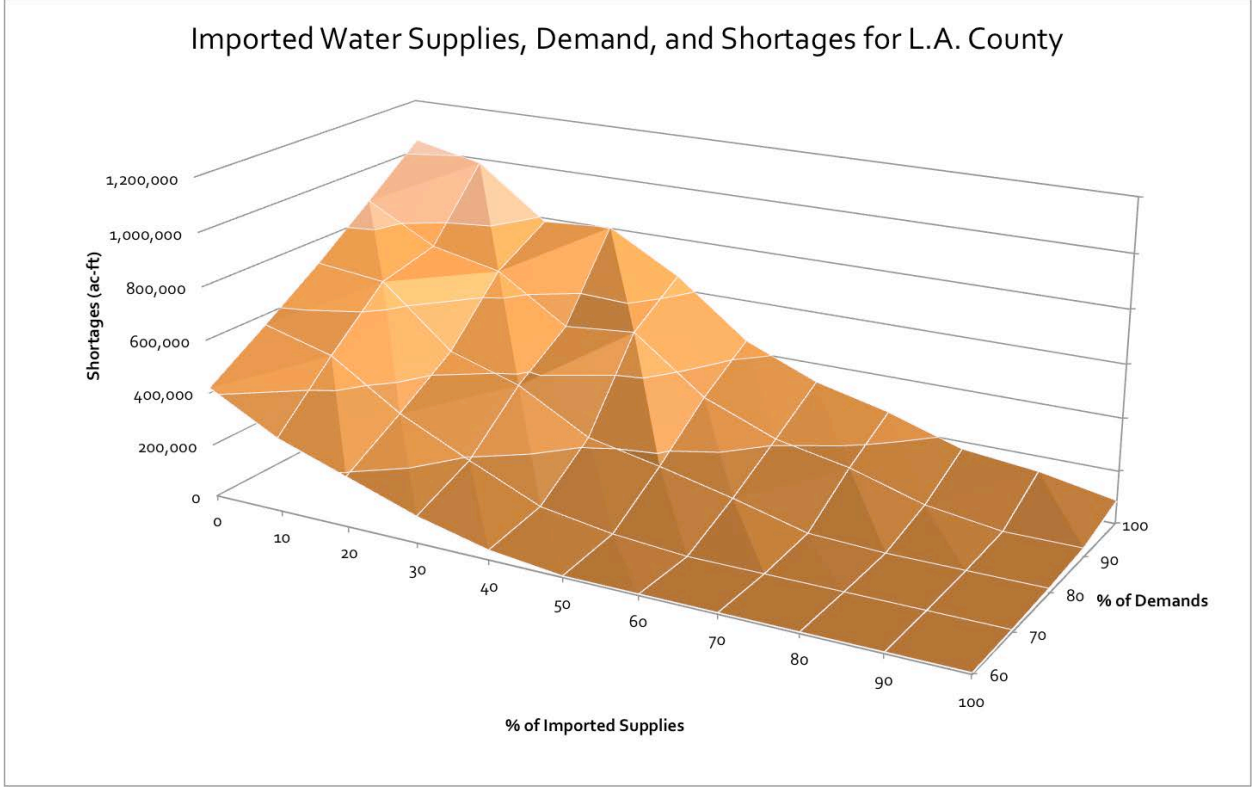
Procedure and Software



Results

Results: Visualizing Scenarios

Tradeoffs in water supply, demands, shortages



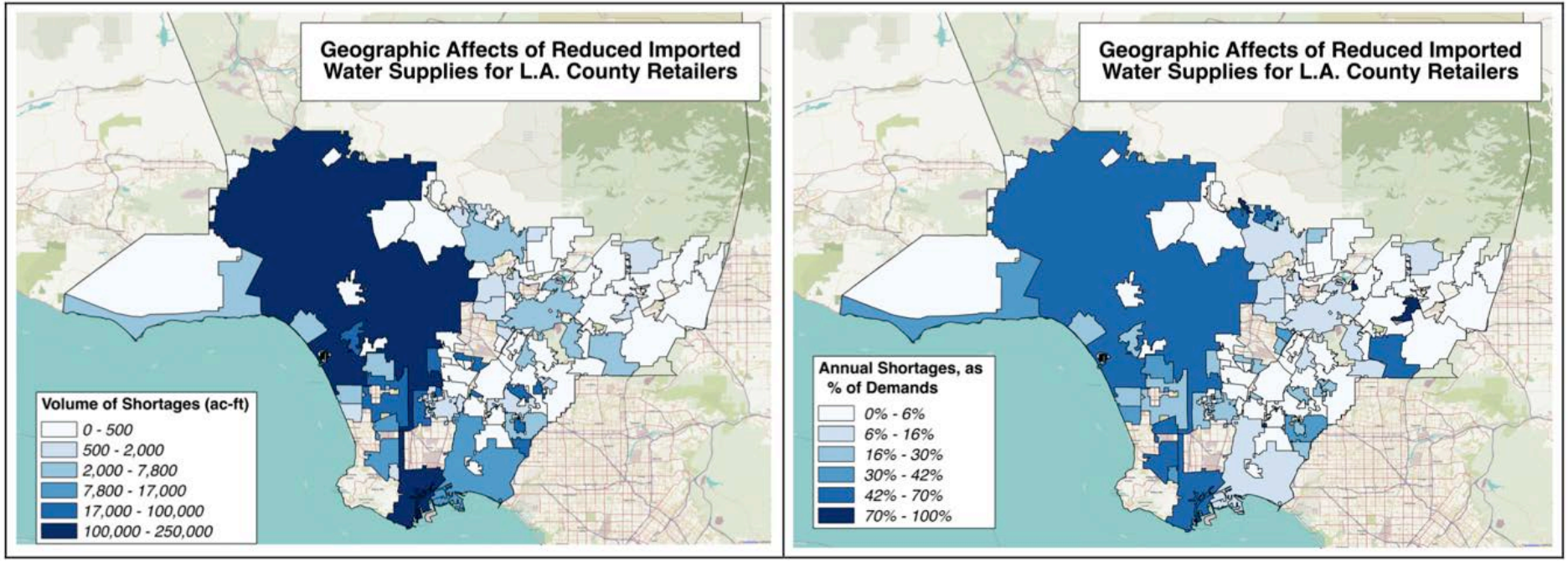
Results: Supply Portfolios

Quantifying tradeoffs

Field	Scenario						
	A	B	C	D	E	F	G
Demand (%)	100	100	100	80	80	60	SP
Imported Water Supply (%)	100	50	0	50	20	40	70
% Supply Source of Total Annual Supply							
% Supply as Imported	58%	40%	0%	40%	22%	37%	57%
% Supply as Groundwater	34%	47%	83%	48%	63%	54%	37%
% Supply as Reuse	7%	12%	15%	11%	14%	9%	5%
% Supply as Surface Water	1%	1%	2%	1%	1%	1%	1%
SW Capture as % of Supply	44%	43%	44%	52%	54%	68%	62%
% Shortages	5%	25%	58%	12%	32%	3%	10%
Per Capita Use, gpd, based on total demands (total deliveries)	151 (172)	151 (125)	151 (70)	121 (123)	121 (92)	90 (109)	105 (122)

Results: Across Retailers

Uneven vulnerability



Scenario: 80% of demands and 20% of imported water supplies

Sustainability Planning Scenario

- What would a water-efficient city look like?
  - Indoor: 50 gallons per capita per day (gpcd)
  - Outdoor: Tree canopy water needs, climate and ecosystem appropriate landscapes
  - Commercial and Industrial (historic)

- Aggressive conservation scenario, but not maximum

- Can cut imports by 30-40% with minimal shortages and low risk of groundwater overdraft using current infrastructure

Getting to Local Water Supply in LA

- What would it take?
  - Implement currently planned reuse and stormwater capture projects
  - Conversion of landscapes and tree canopy to low-water species (~84 gpcd)
  - Only importing water during wet years (top 25%)

Our analysis indicates that these efforts would create a sustainable water supply portfolio for LA County

Conclusions

LA County can significantly reduce water imports

30% imported water reductions with current system

50-75% possible with currently planned upgrades

A Vision for LA Water Management

Thinking across many goals

Smart solutions would:

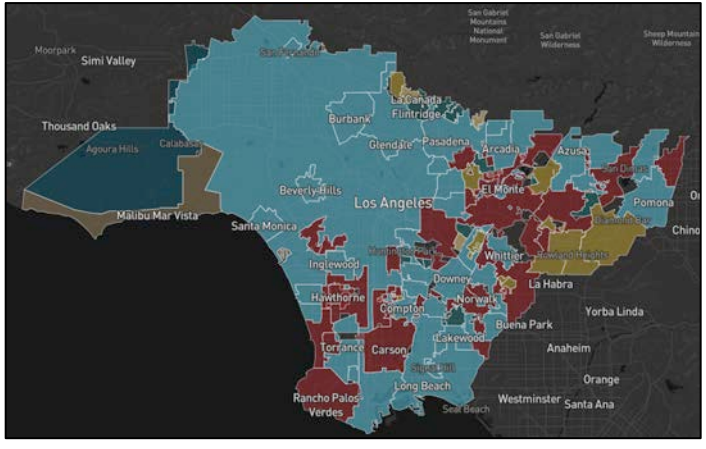
Increase reliability & local reliance

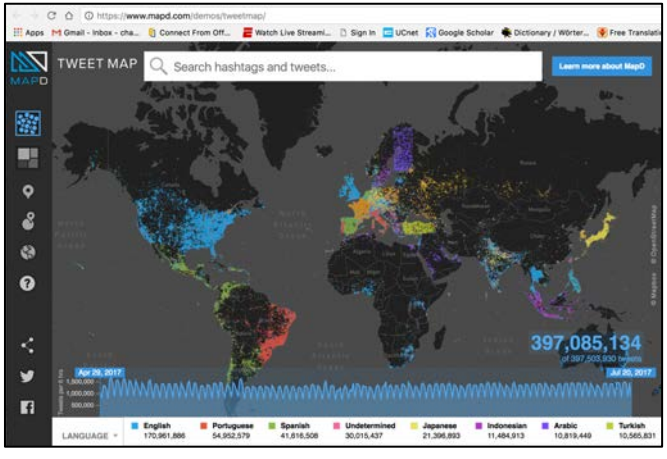
Be cost-effective

Reduce energy intensity

Improve water quality

A Vision for LA Water Management





Build Dynamic Tools & Places for Collaboration

A Vision for LA Water Management

- Getting there:
  - Participatory planning
  - Address key data gaps
    - Surface-to-groundwater interactions
    - Leak and loss data
    - Urban Heat Island effects
  - Institutionalize the tools
    - Data collection
    - Modeling for planning and evaluation

Links

LA Water Hub
http://waterhub.ucla.edu

Source Code and Data
https://erikporse.github.io/artes/

Contacts
diane.pataki@utah.edu
eporse@ioes.ucla.edu
spincetl@ioes.ucla.edu
thogue@mines.edu

Thanks to: