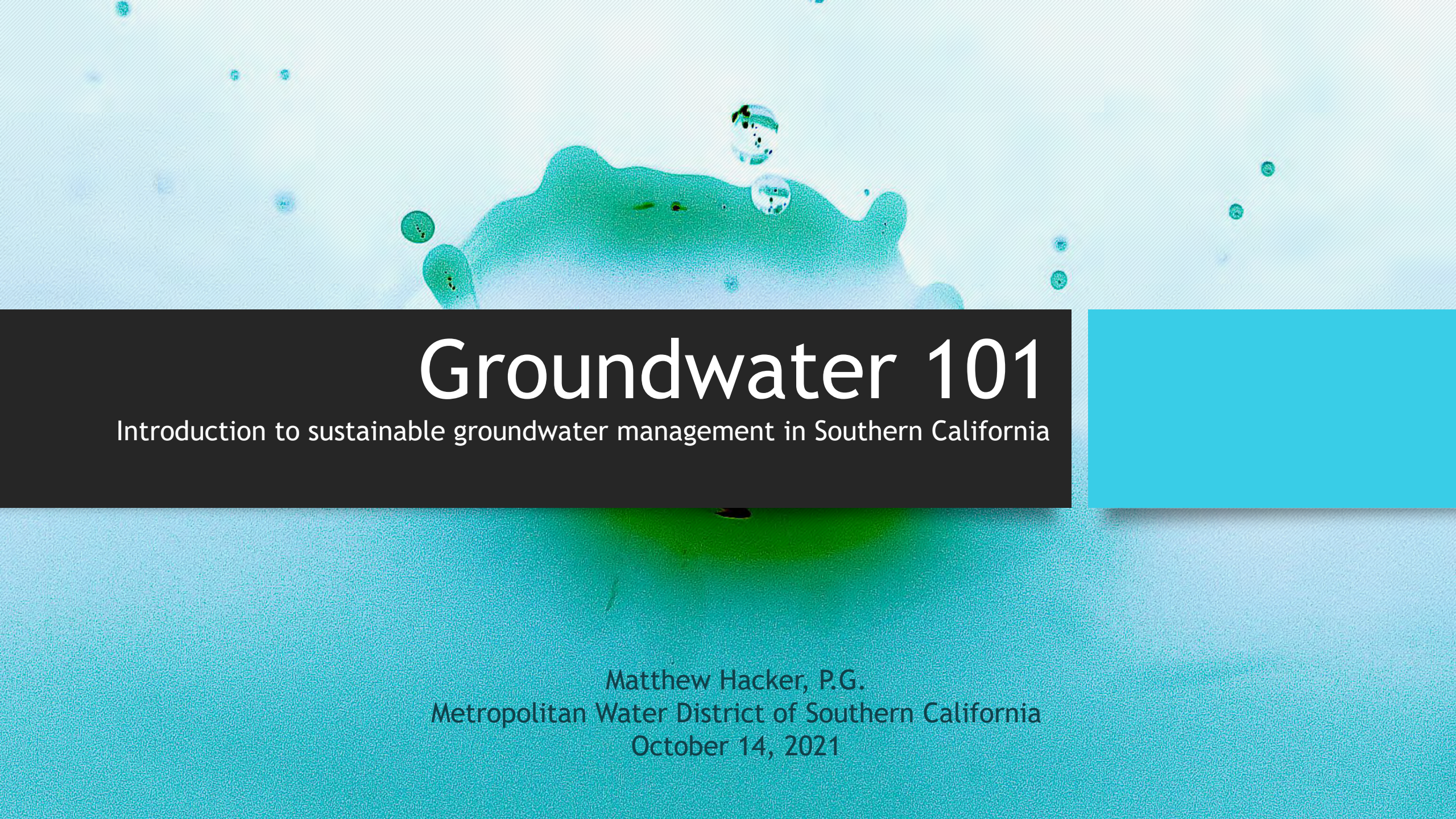


Groundwater 101

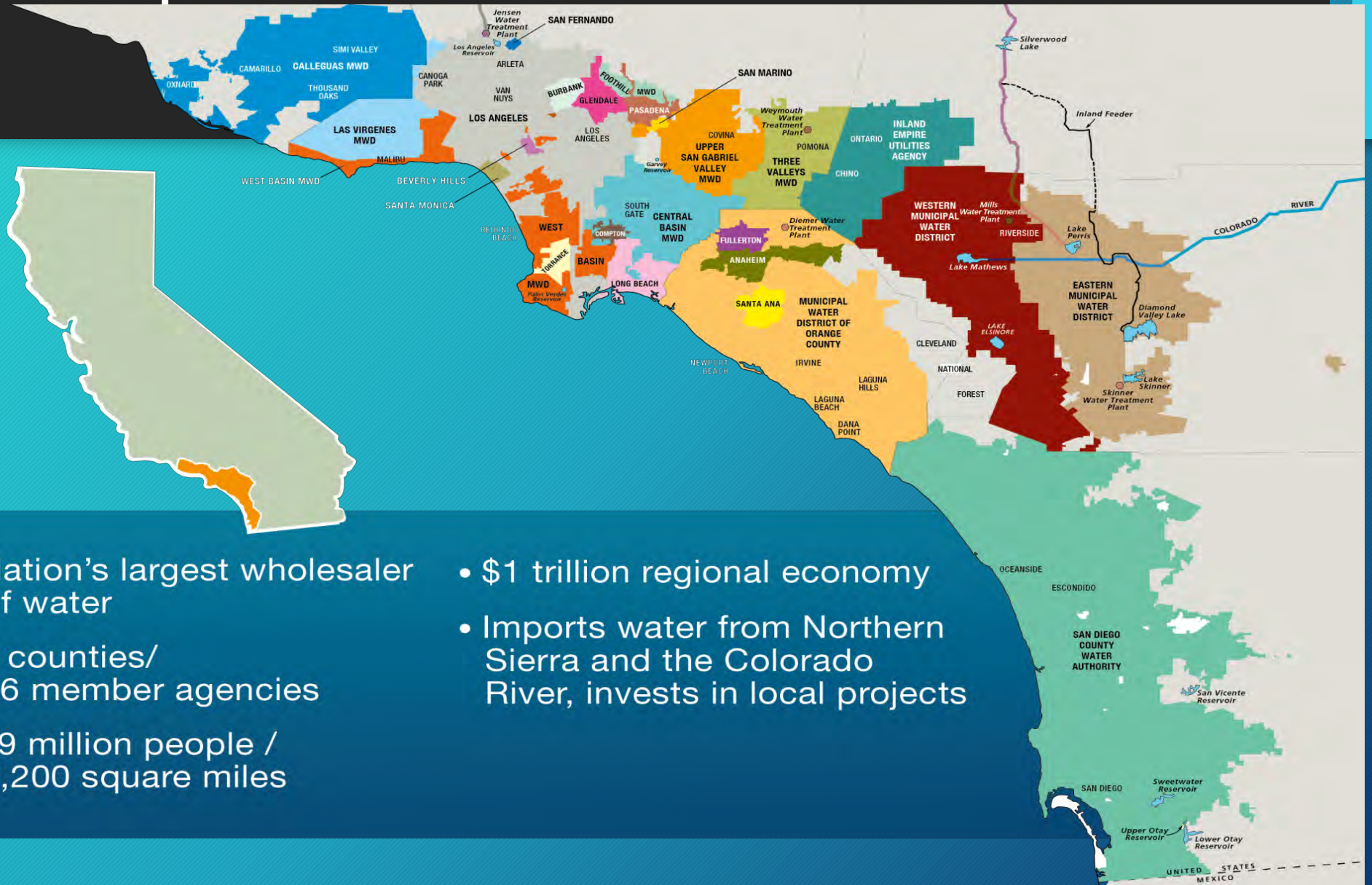
Introduction to sustainable groundwater management in Southern California

Matthew Hacker, P.G.
Metropolitan Water District of Southern California
October 14, 2021

Agenda

Overview

About Metropolitan



- Nation's largest wholesaler of water
- 6 counties/ 26 member agencies
- 19 million people / 5,200 square miles
- $1 trillion regional economy
- Imports water from Northern Sierra and the Colorado River, invests in local projects

Sources of Supply

Metropolitan's Role in Local Supply Development

Metropolitan's Role in Local Supply Efforts

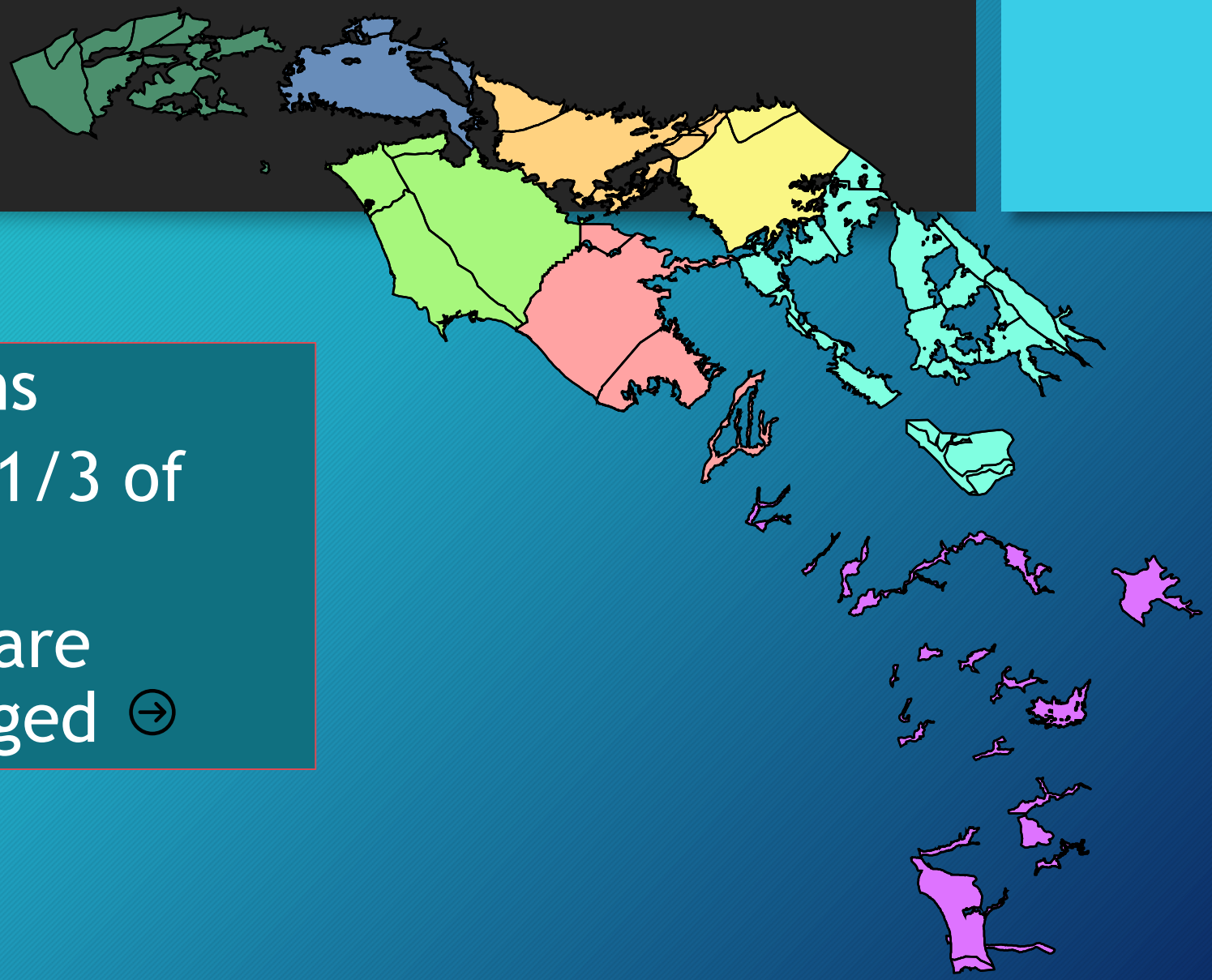
LRP

Future Supply Actions

Facilitation and Leadership

GW/Conjunctive Use

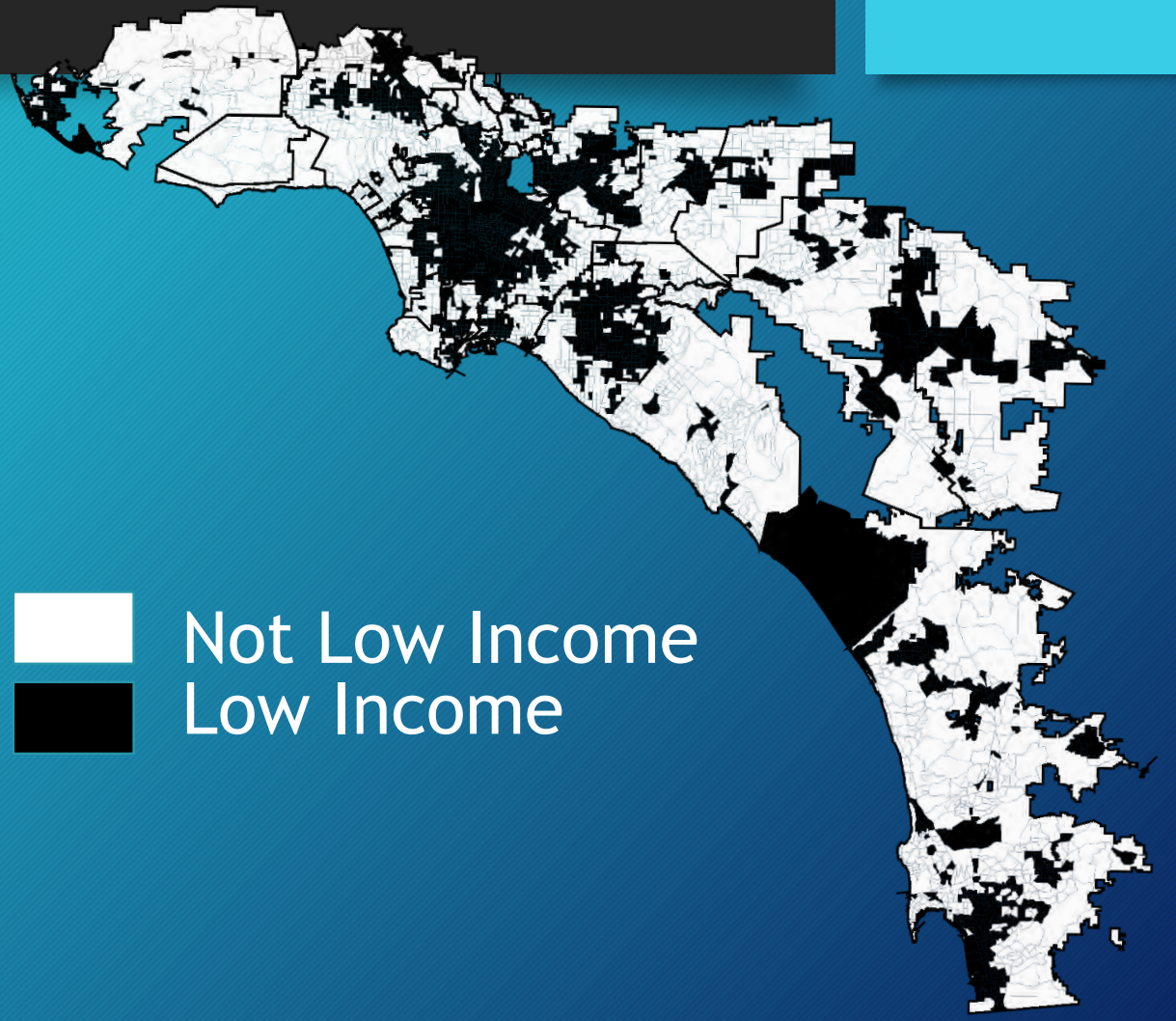
Groundwater Basins



- 88 groundwater basins
- Groundwater is over 1/3 of regional supplies
- 96 percent of basins are adjudicated or managed

Low-Income Census Tracts in Service Area

- 9.5 million people live in low-income areas (census tracts below 80% of median household income)
- ~50% of population in Metropolitan service area
- Many of these areas also overly large groundwater basins



Case Studies

Case Studies

LA Coastal Basins

- ***Hollywood***
- ***Santa Monica***
- ***Central*** adjudicated in 1965
- ***West Coast*** adjudicated in 1961

SGV Basins

- Raymond adjudicated in 1944
- Main San Gabriel Adjudicated in 1973
- Puente Adjudicated in 1986
- Six Basins adjudicated in 1998

ULARA Basins

- San Fernando
- Sylmar
- Eagle Rock
- Verdugo Adjudicated in 1979

Groundwater Sustainability

Groundwater Cycle

15.2 inches
8.7 MAF

Groundwater Recharge

Active
325 TAF

Passive
745 TAF

Evapotranspiration

7.2 MAF

Runoff to Ocean

457 TAF

93% used

What is Groundwater Sustainability in Southern California?

Reliability

Long-term balance of pumping and recharge

Resilience

Prepared for future climate change and other vulnerabilities

Sustainability

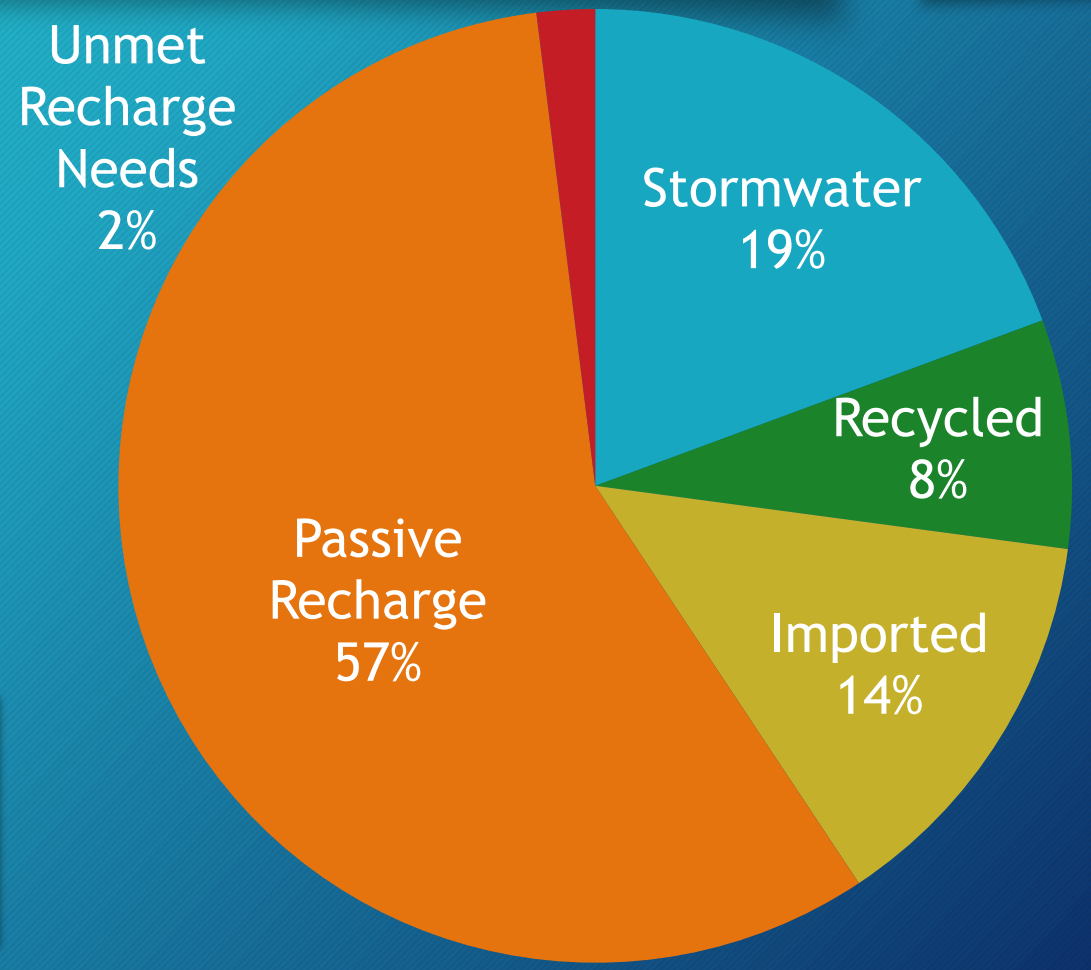
Groundwater Reliability

Groundwater Production

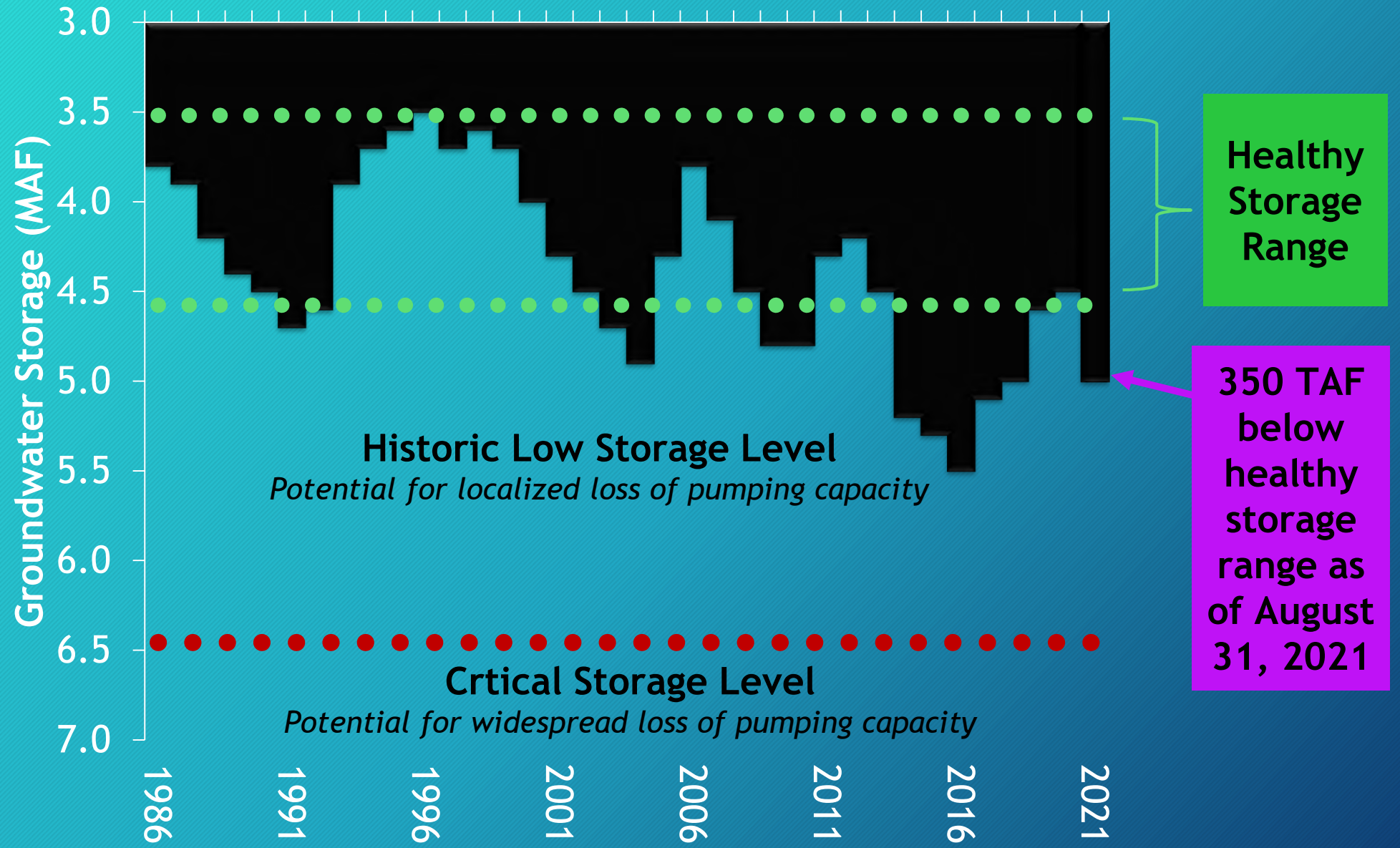
- 1.5 million acre-feet per year*
- Declined ~25% since 2000

About 3/4 of the groundwater production is supported by natural recharge

Groundwater Recharge Sources



Region Withdrew >1 million AF from GW since 2000



Groundwater Conditions

Current Groundwater Conditions

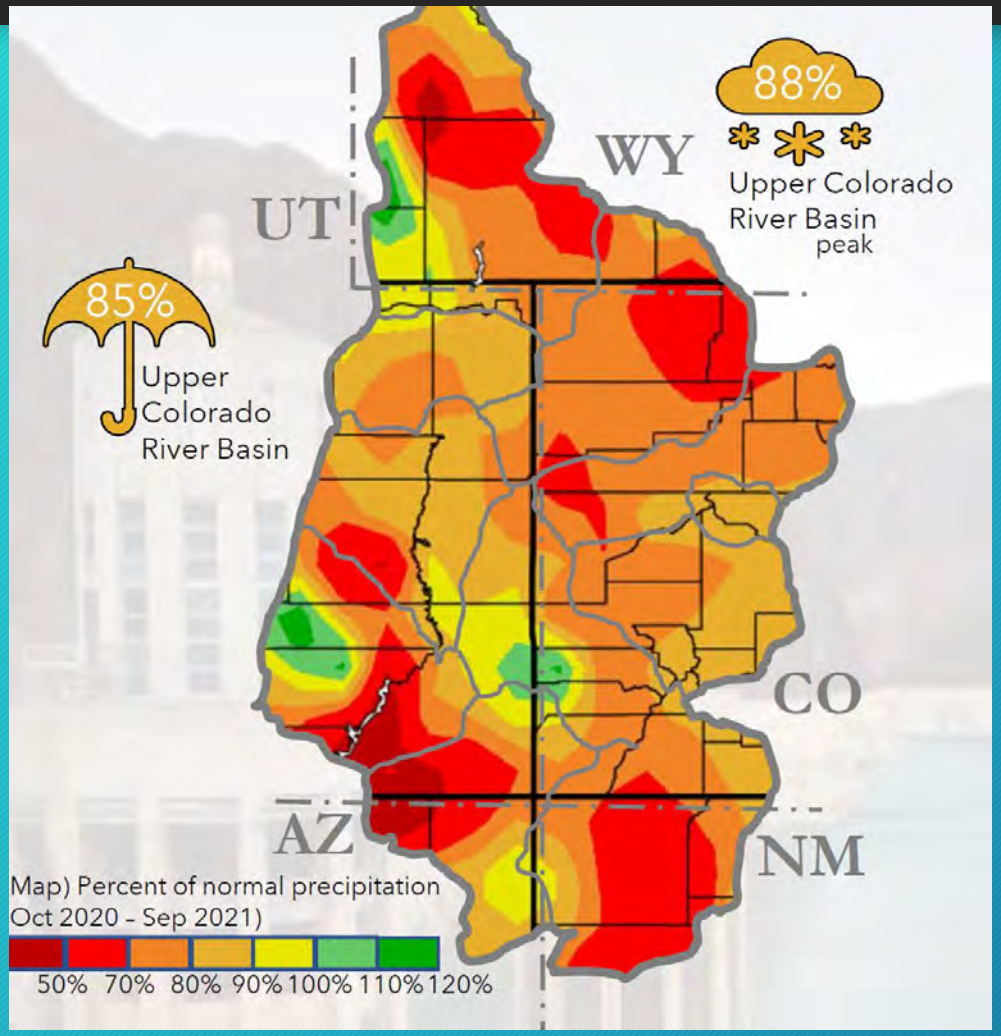
Net loss in GW storage of >1 MAF from 2000-2021.

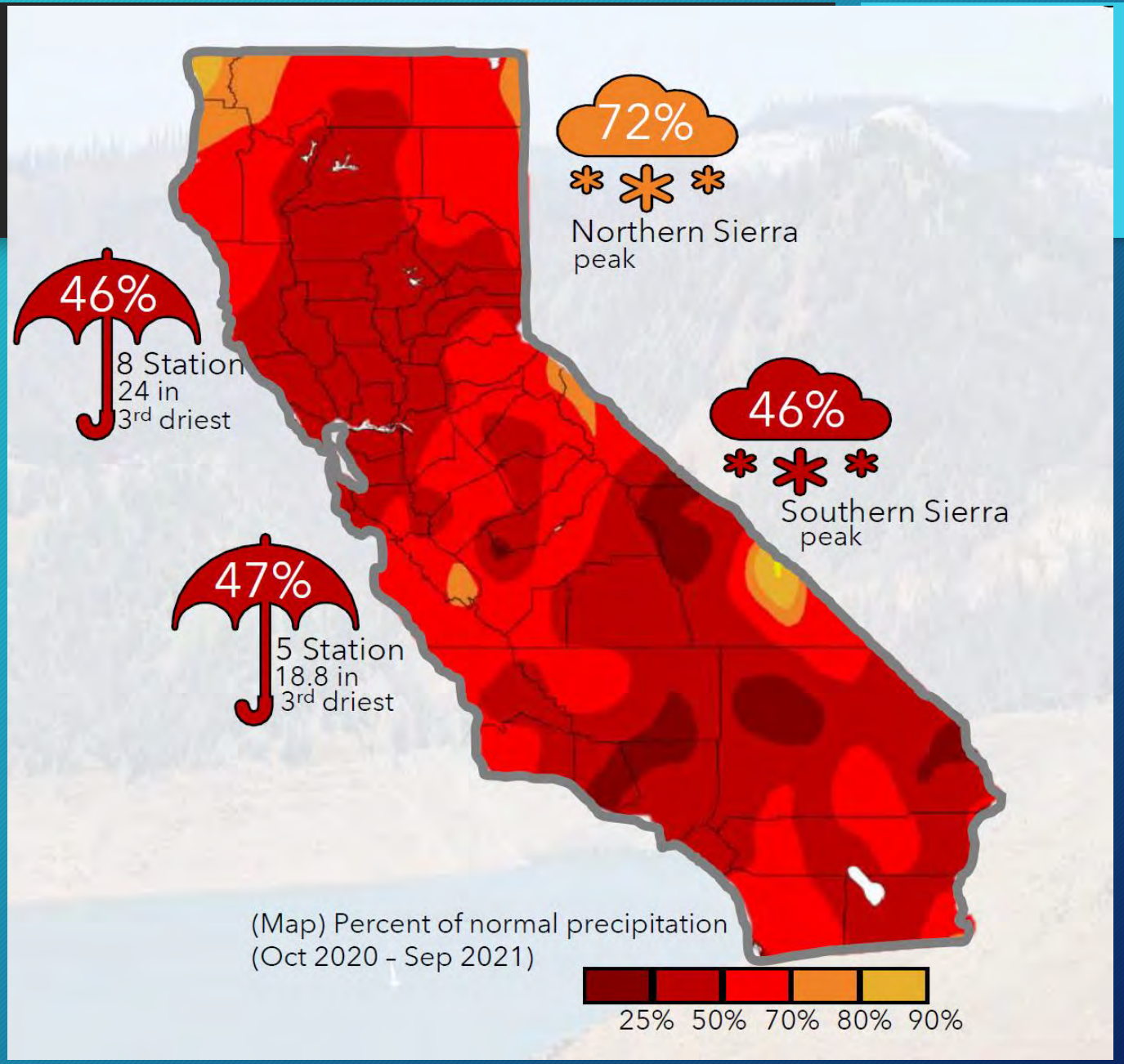
GW production declined ~ 25% since 2000

Active recharge declined 6% since 2000

Vulnerabilities and Opportunities

Drought in the Southwest





Climate change assumptions by 2100

- 99th percentile precipitation events
- >1.3 inches
- Increase up to 20%

Precipitation
on wettest days

- Increase up to 20%
- 2/3 of rainfall falls in this period
- Precipitation pattern shifts forward 1-2 months

Precipitation

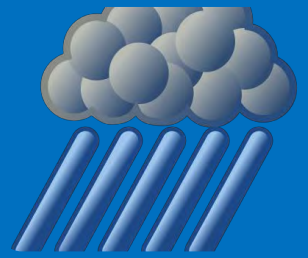
Dec-Feb

- Decrease up to 20%
- Less likely to have "Miracle March" events

Precipitation
Mar- May
Sep-Nov

Groundwater Impacts of Climate Change

- Annual precipitation predicted to increase 5-13% by 2100
- Is equal to ~0.75-2 inches
- ET increases due to increase in temperature



Stormwater Capture

- Flashier in nature, big storms/atmospheric rivers continue to bypass recharge facilities
- Decrease annual average by 3-8% by 2100

Passive Recharge

- Largely driven by rainfall and outdoor water use
- Increase annual average by 0.3-1.2% by 2100

Change in GW recharge

- Small change predicted
- Decrease 0-1.1% by 2100

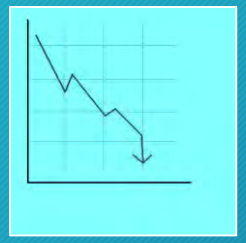
Key Vulnerabilities

Small reduction in annual average recharge amounts with potential for increased flooding by end of century

Water quality issues

PFAS, nitrate, TDS, perchlorate, VOCs

Impacts of climate change



Declining storage

Potential for reduced production, high pumping costs, and subsidence

Heavy reliance on imported water or groundwater puts pressure on these resources

Heavy reliance on a single resource

Groundwater Opportunities

Increase potable reuse

- Chino Basin Project
- Regional Recycled Water Program
- LADWP's Operation NEXT
- San Diego PureWater

Maximize use of groundwater basin

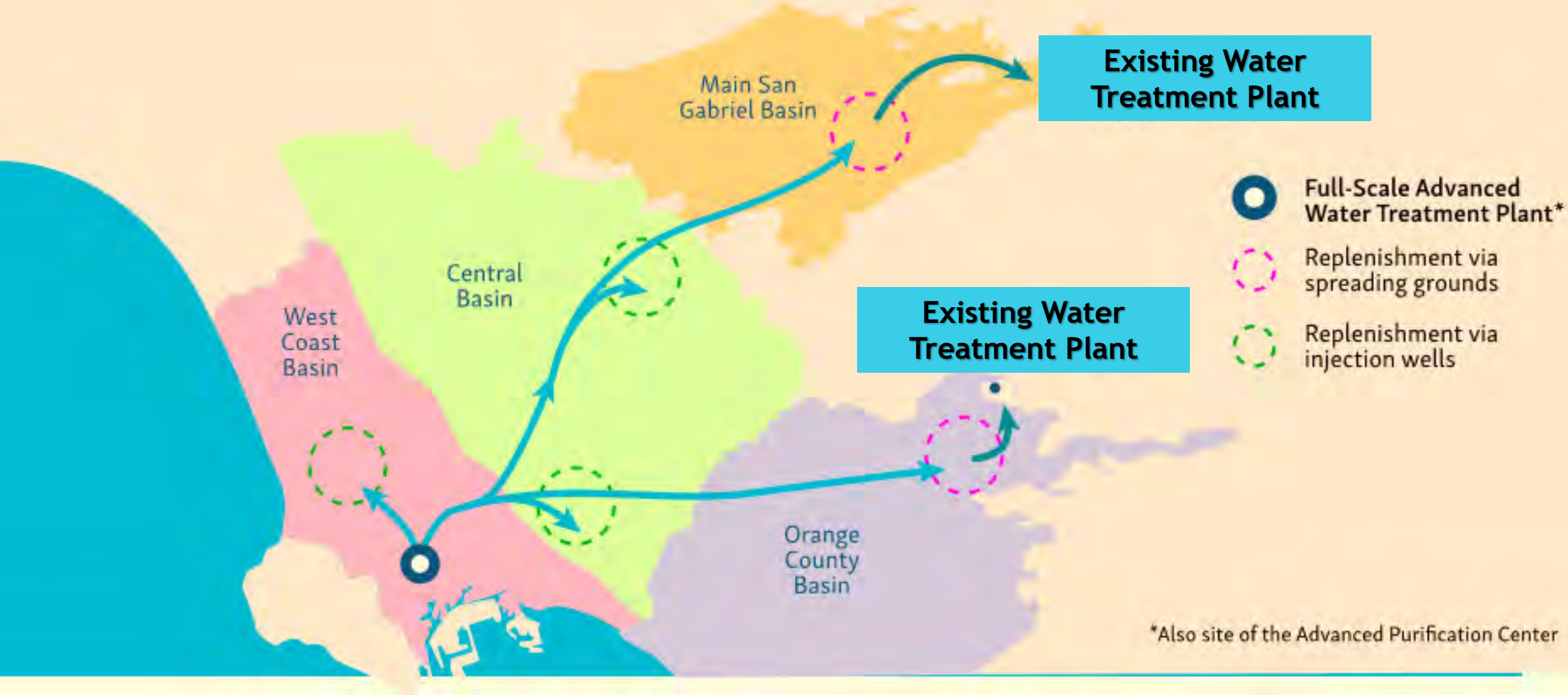
- Unused storage
- Under pumped rights
- Treatment

Increase recharge

- Stormwater
- Recycled Water

Metropolitan’s Regional Recycled Water Progam

Innovation in Groundwater & Recycling



Proposed Regional Recycled Water Program

Up to 150 million gallons per day of purified water from LACSD for groundwater recharge & raw water augmentation

Enough water for over 500,000 homes

Largest water recycling project of its kind in world

Regional Recycled Water Program Benefits

Earthquake

Prepares the Southland for the event of a catastrophic earthquake by increasing local water supplies.

Drought

Produces a drought-proof source of water, readily available rain or shine.

Groundwater

Replenishes groundwater basins, which provide 30% of Southern CA's water supply and have seen levels drop to historic lows in recent years.

Economy

Helps meet needs of region's growing economy and population at a cost comparable to other local water resources.

Wastewater

Uses region's largest untapped source of wastewater, currently sent to the ocean.

Joint Water Pollution Control Plant

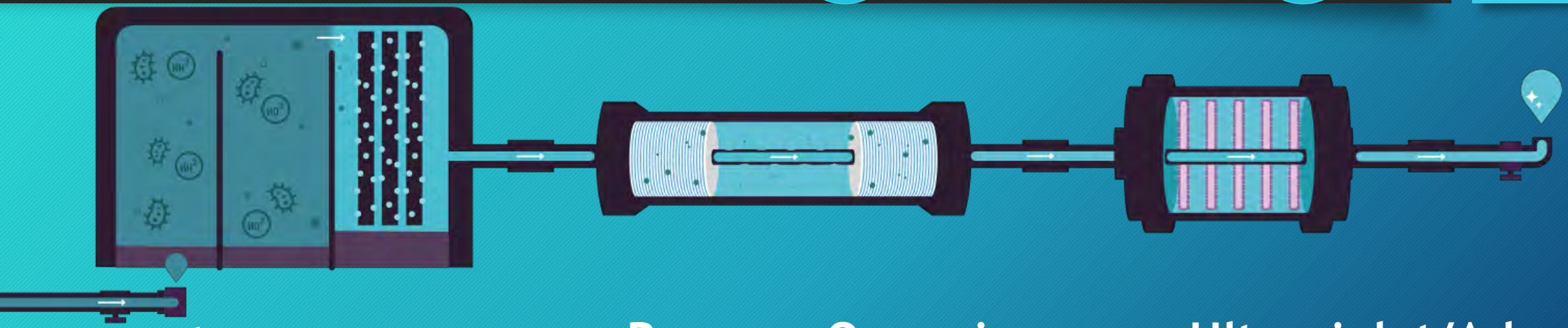
- Average flow of ~260 MGD
- Permitted capacity of 400 MGD
- Primary and secondary treatment
- Currently discharges to the ocean

TREATMENT PROCESS

1

2

3



Membrane Bioreactors

Microorganisms remove ammonia and other nitrogen compounds, while membranes filter tiny particles, smaller than 1/100 of a grain of sand.

Reverse Osmosis

Pressurized membranes further remove microscopic materials, such as bacteria, pharmaceuticals and salts, eliminating more than 99% of all impurities

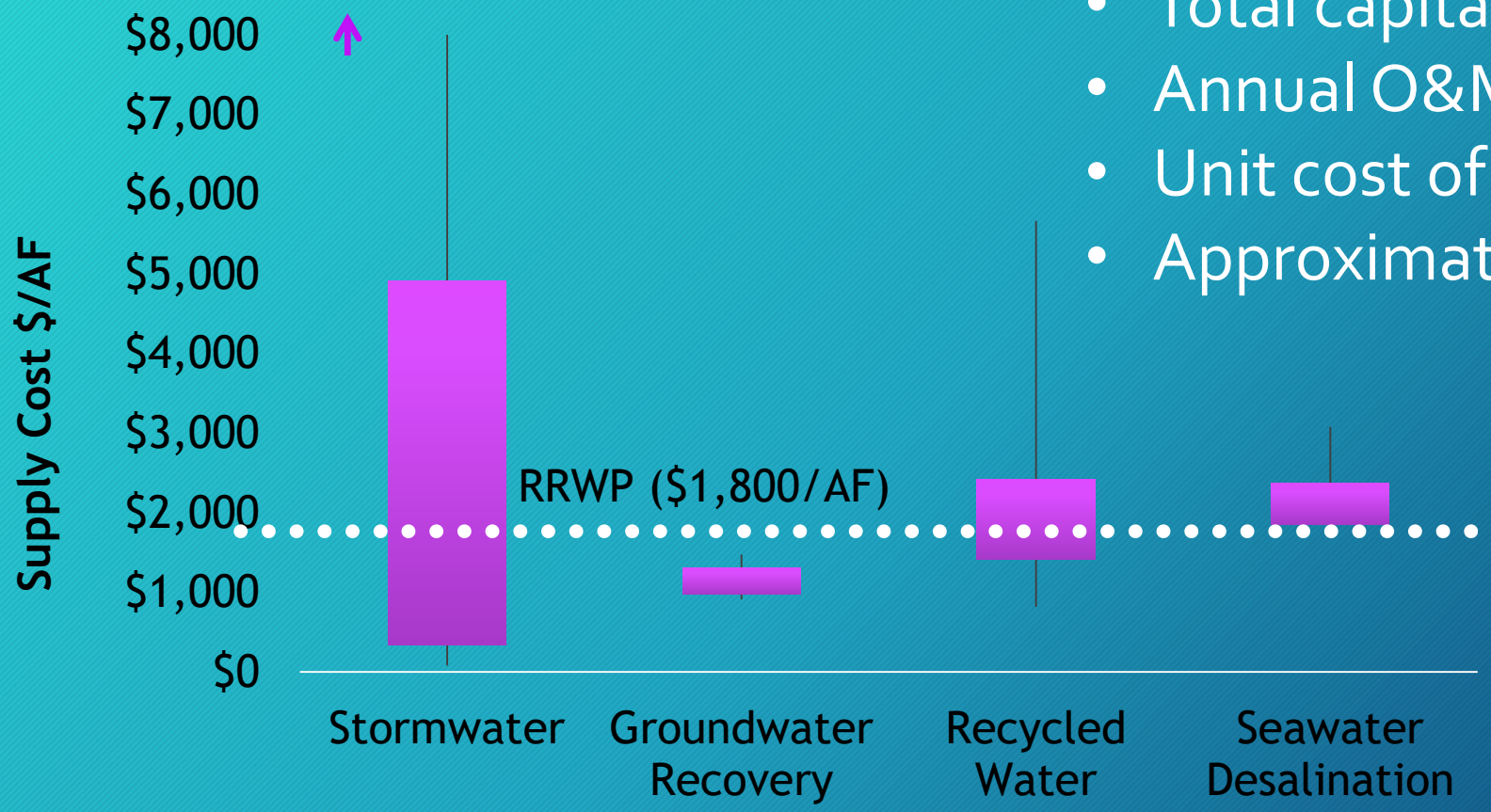
Ultraviolet/Advanced Oxidation Process:

Ultraviolet light and a powerful oxidant destroy any remaining viruses and trace chemical compounds.

Advanced Purification Center

- Demonstration Facility for RRWP
- Grand opening on October 10, 2019
- 0.5 MGD

Program Cost



- Total capital cost of $3.4 billion
- Annual O&M cost of $129 million
- Unit cost of approximately $1,800/AF
- Approximately 42,000 jobs created

Tours and Outreach

- Tours for public and key stakeholders
- Ages 10 and up welcome
- School program
- Invite others to attend

Coordination: RRWP and LADWP's Operation Next

Summary

Summary

Groundwater Management

- 88 groundwater basins
- 96% of basins are adjudicated or managed
- Conjunctive Use key component of Metropolitan's groundwater strategy

Current Groundwater Conditions

- Net loss in GW storage of >1 MAF from 2000-2020. 0.4 MAF below healthy storage
- Additional recharge needed to maintain existing levels of groundwater production.

Key vulnerabilities

- Water quality issues
- Impacts of climate change
- Declining storage
- Heavy reliance on a single resource.

Opportunities

- Increase recycled water use (IPR/DPR)
- Maximize use of groundwater basin
- Increase stormwater capture and recharge

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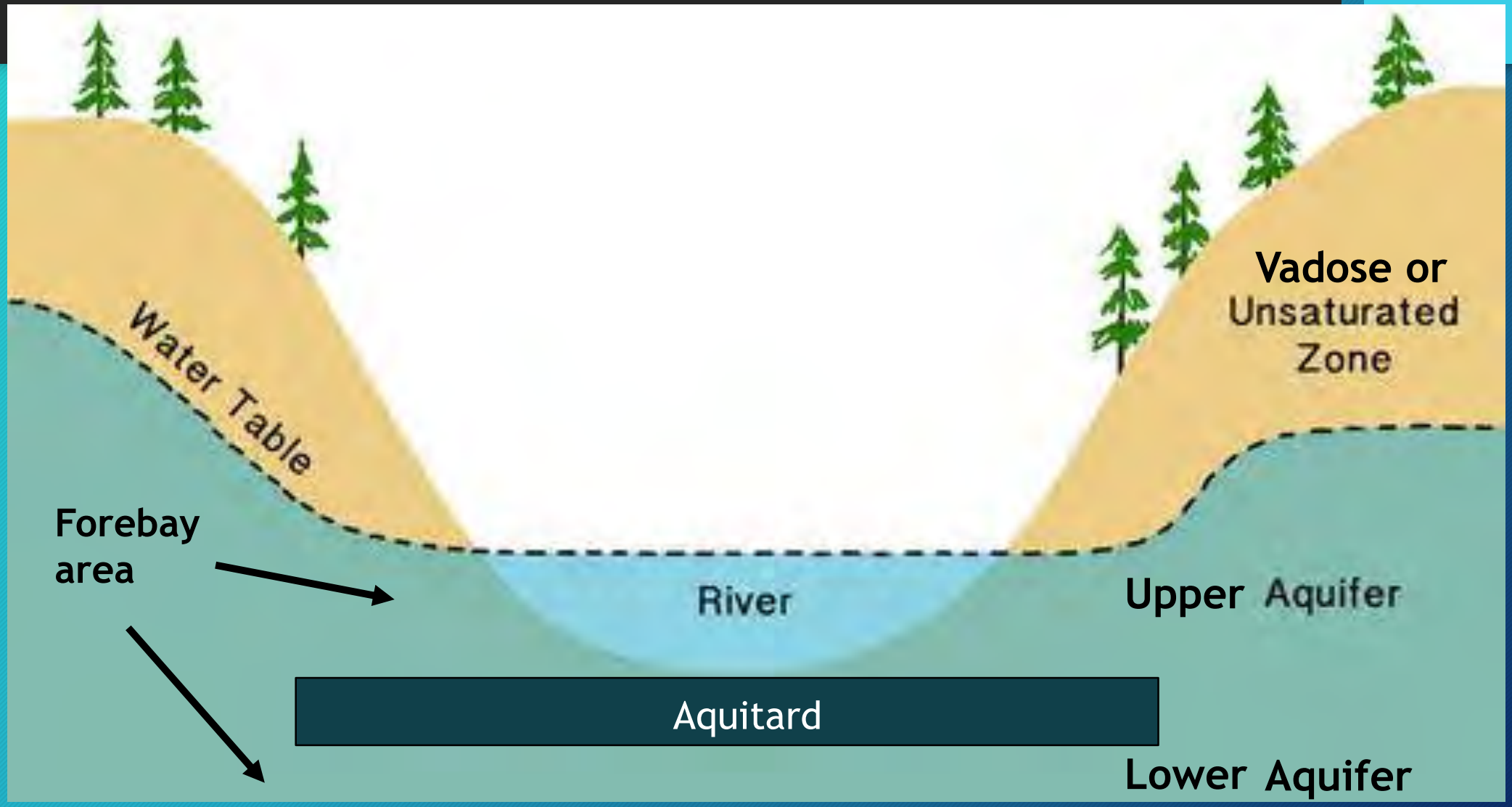
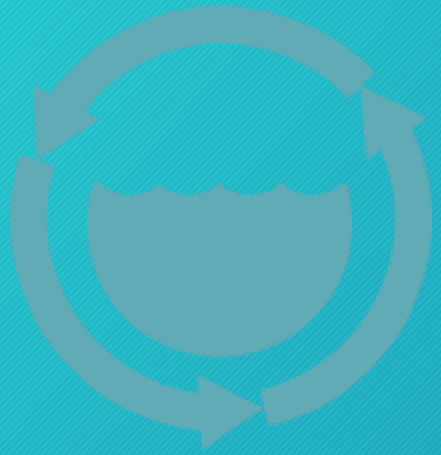
Extra Slides – they are linked

Groundwater Basin Schematic



Local Resources Program

Provides incentives for Metropolitan's member agencies to develop new local projects



Recycled Water (1982)

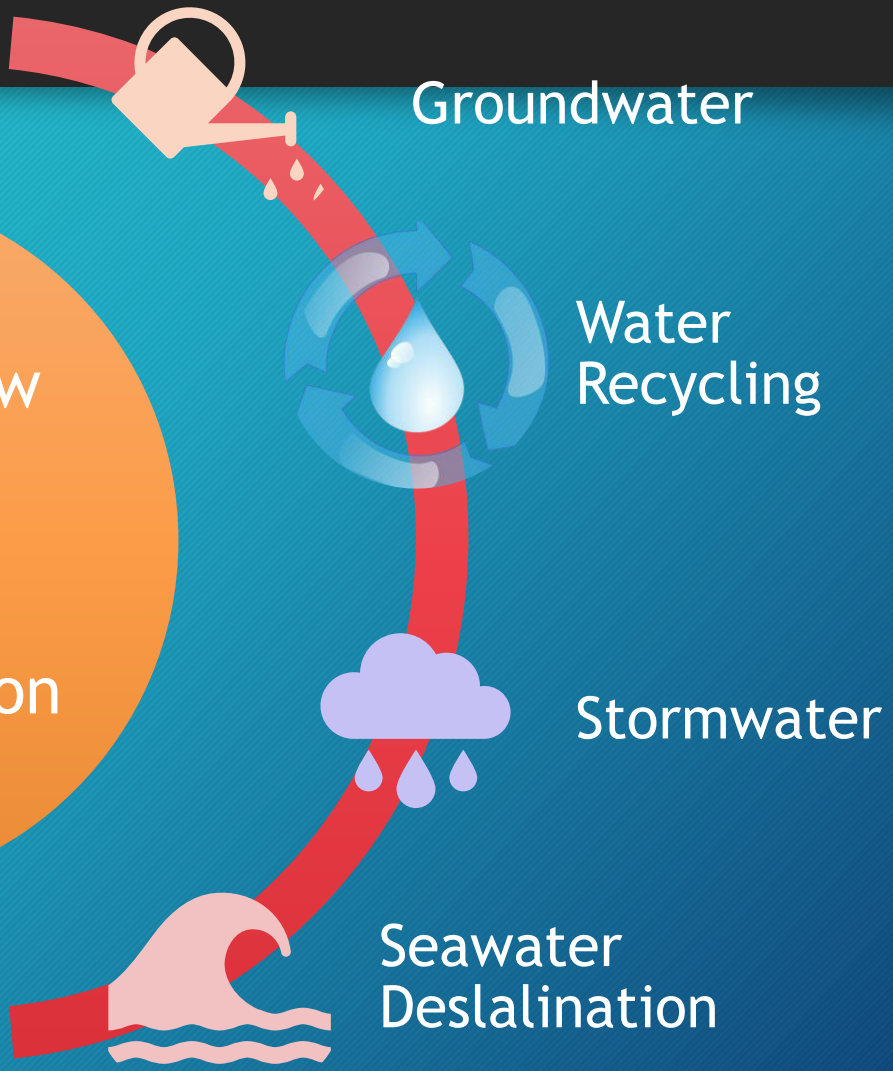
Groundwater Recovery (1991)

Seawater Desalination (2014)

Future Supply Actions

Low Cost, Low Risk Actions

Reduces barriers to implementation



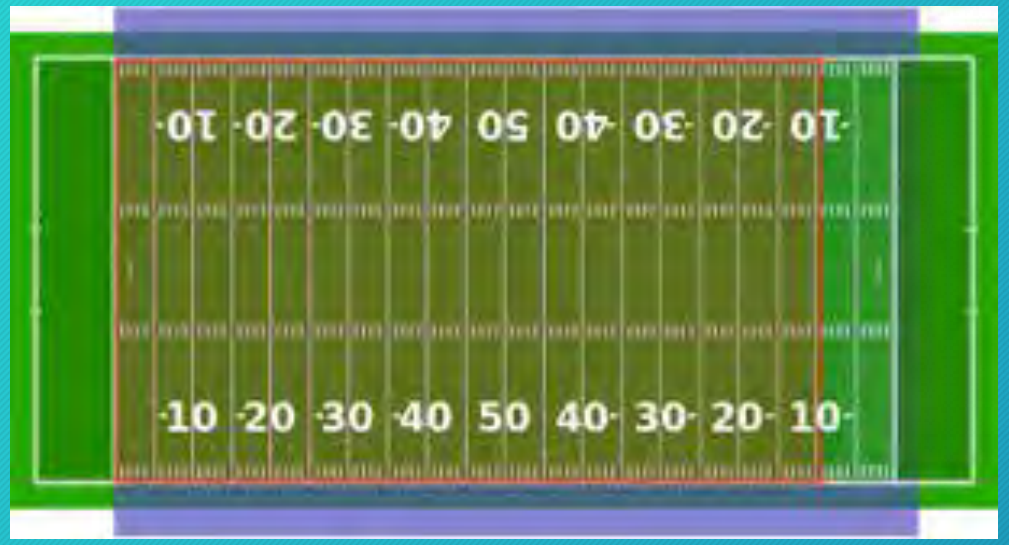
What is conjunctive use?

1. Water is stored in groundwater basins in years when water is available.
2. Later, during dry periods, that previously stored water is pumped out for beneficial uses

Metropolitan has 2 types of conjunctive use programs

- Cyclic
  - Water for groundwater recharge is pre-delivered and paid for later
  - No dry year performance required
- Conjunctive Use
  - Water for groundwater recharge is pre-delivered and paid for later
  - Dry year performance **required**

How much is an acre-foot?



Football Field between Endzones

Filled with 1 foot of water

Meets water needs of a typical family of 4 for 1 year

Types of Groundwater Management

Adjudicated

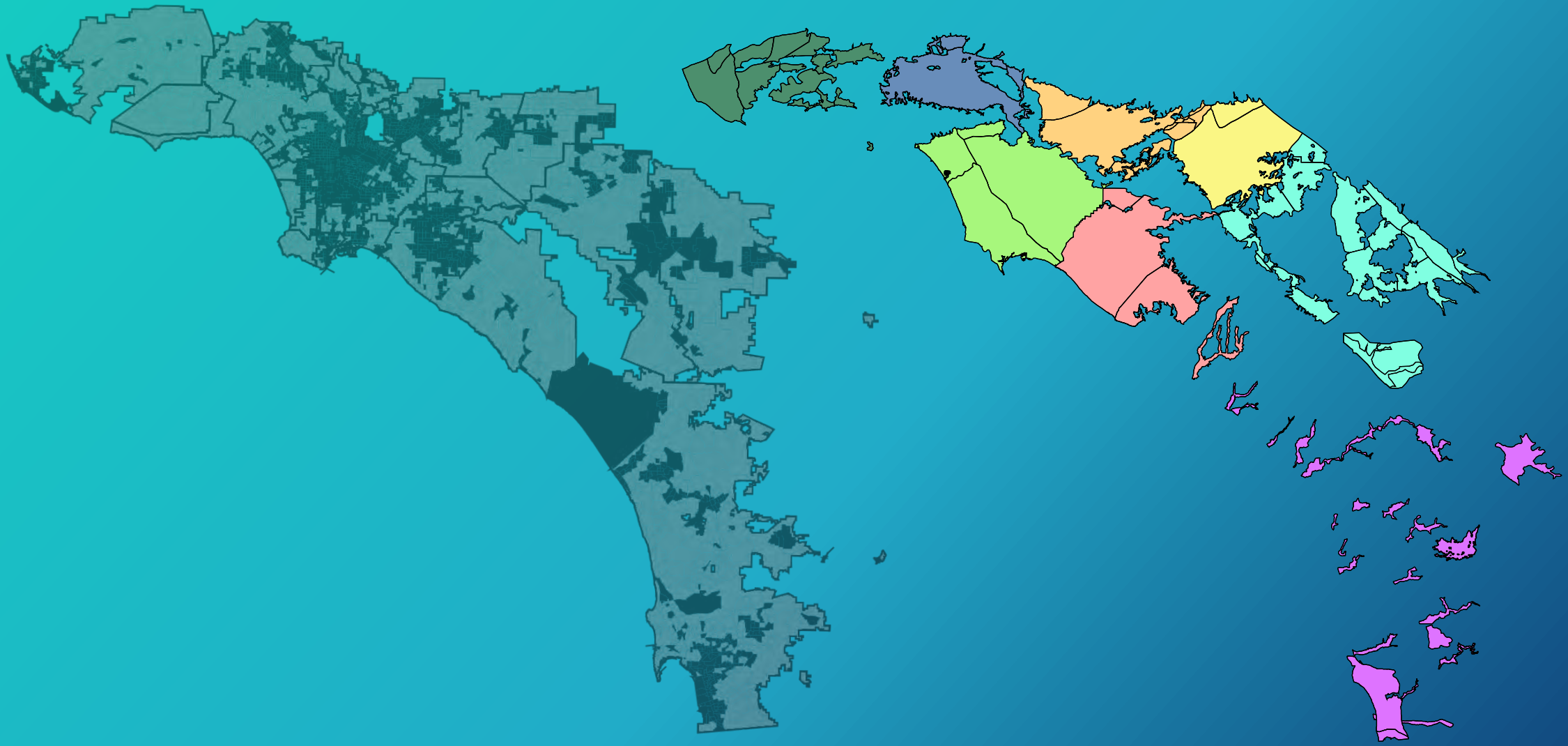
- A court judgement among basin parties
- Typically appoints a watermaster to oversee the adjudication
- Reports to a judge

Managed

- Governed by a groundwater sustainability plan or groundwater management plan
- Created by legislative authority

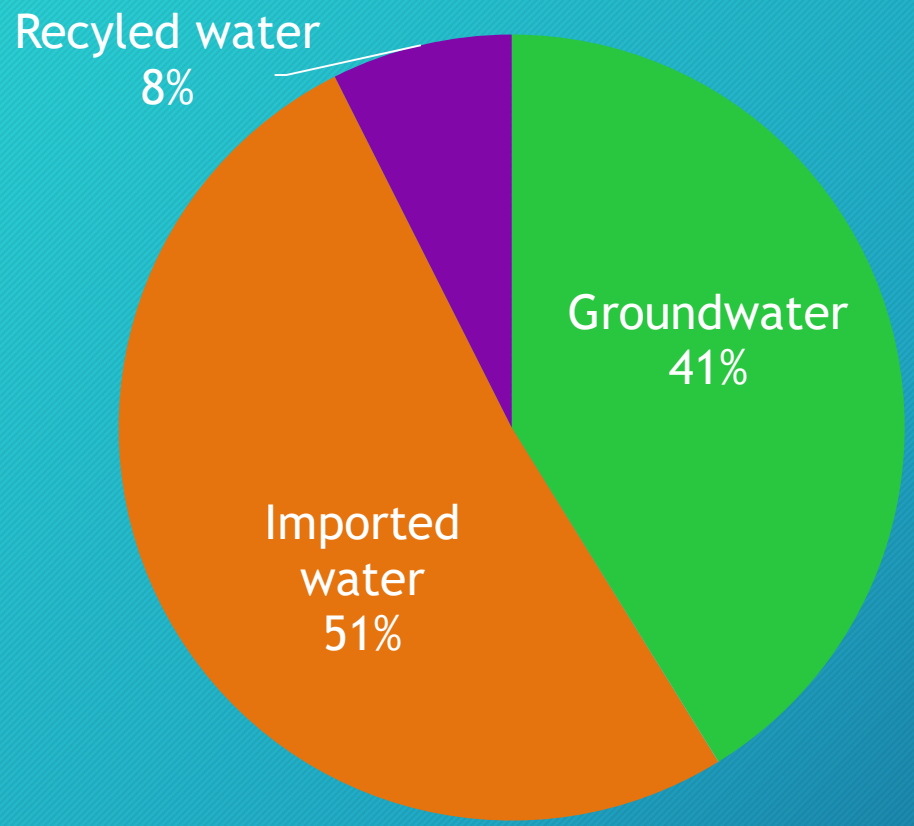
Unadjudicated

- Tend to be smaller basins
- Pumping based upon groundwater rights
  - Pueblo
  - Riparian
  - Appropriative or Overlying

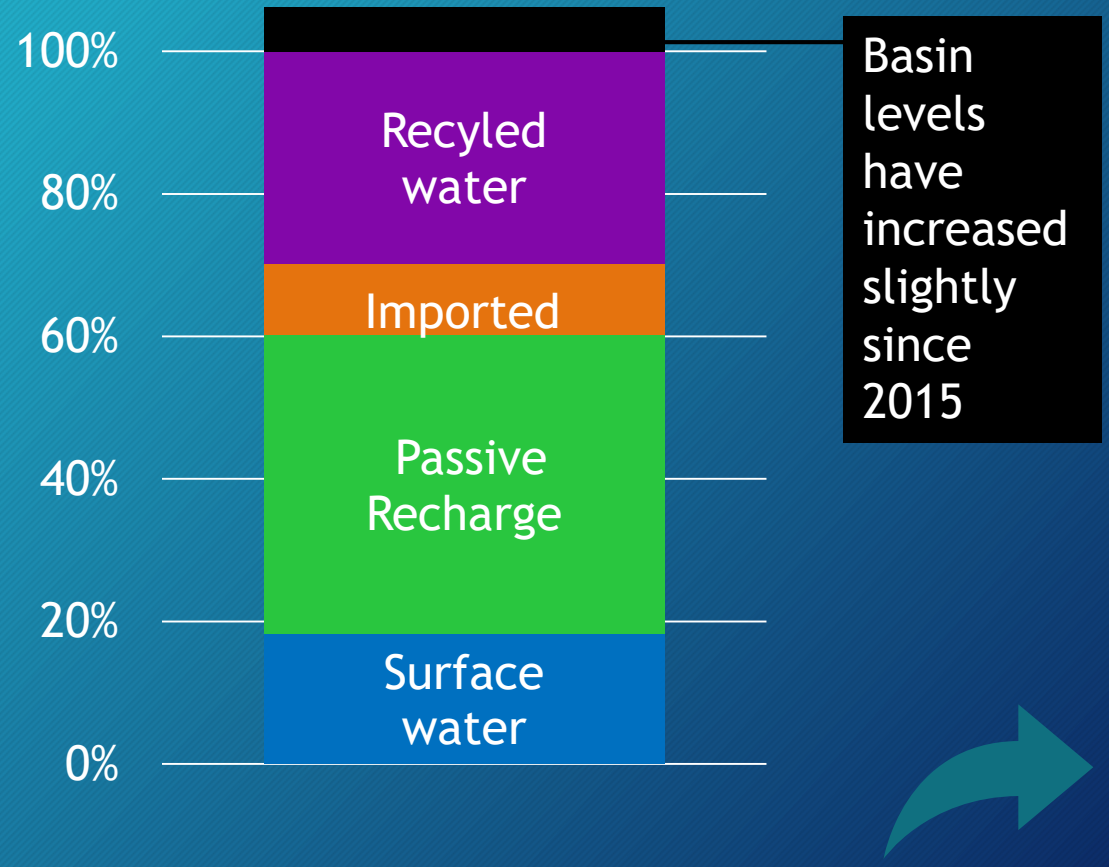


LA Coastal Basins - Conditions Since 2015

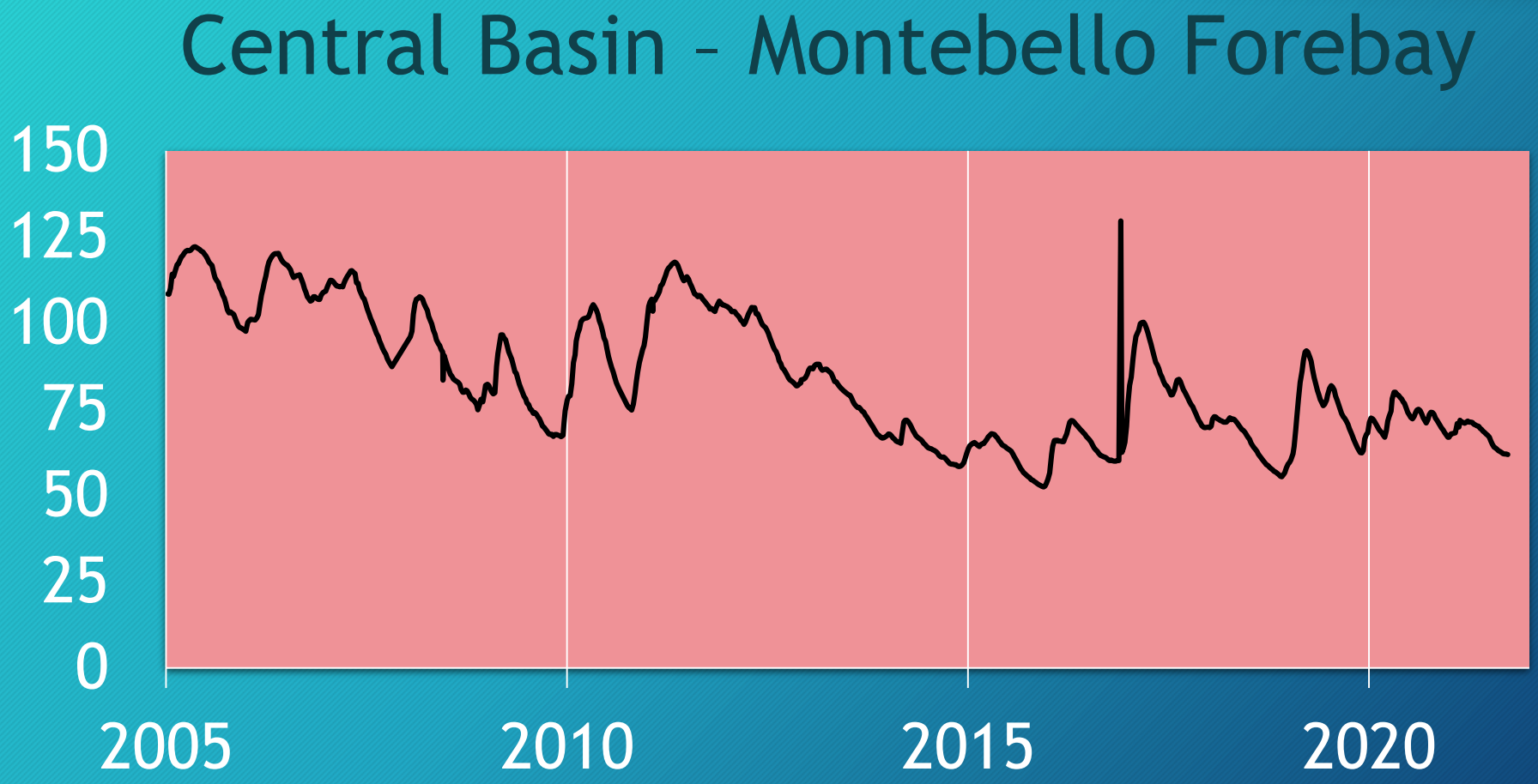
Supply Sources



Recharge Sources

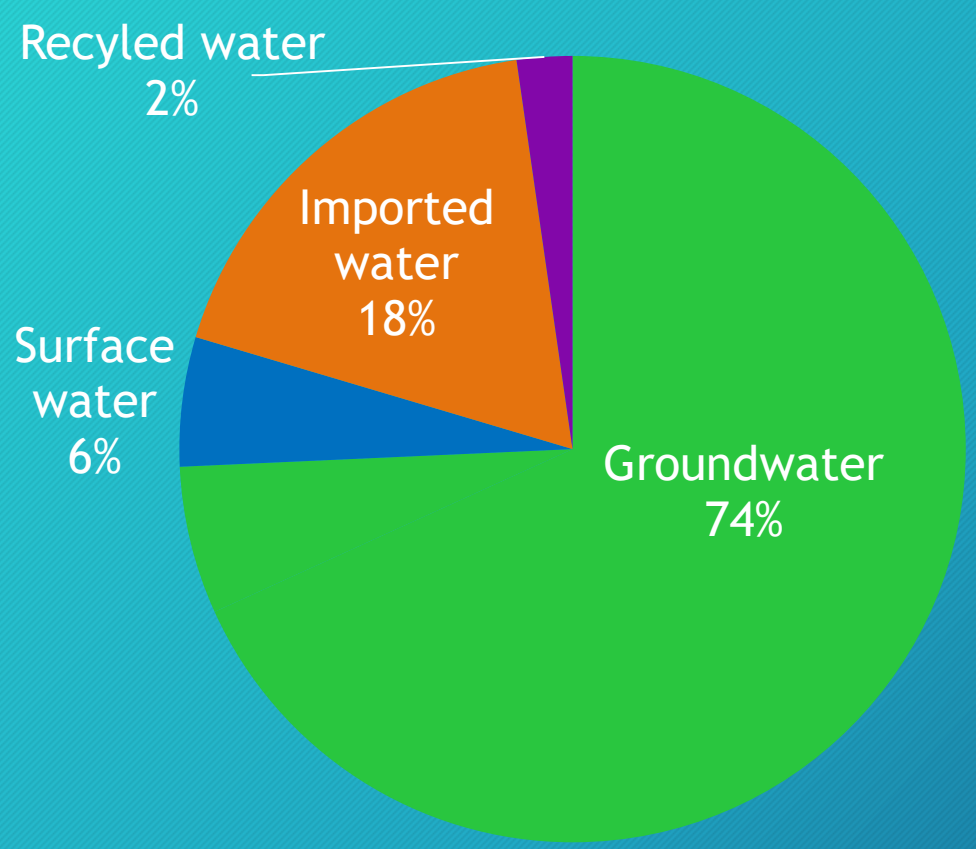


Water Level Changes in LA Coastal Basins

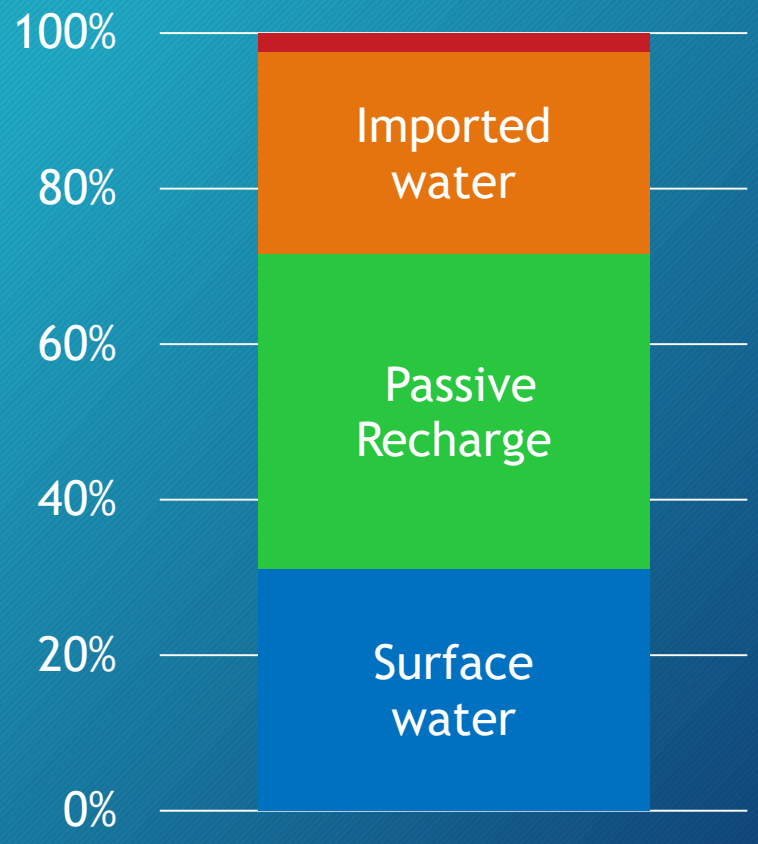


San Gabriel Valley – Conditions Since 2015

Supply Sources



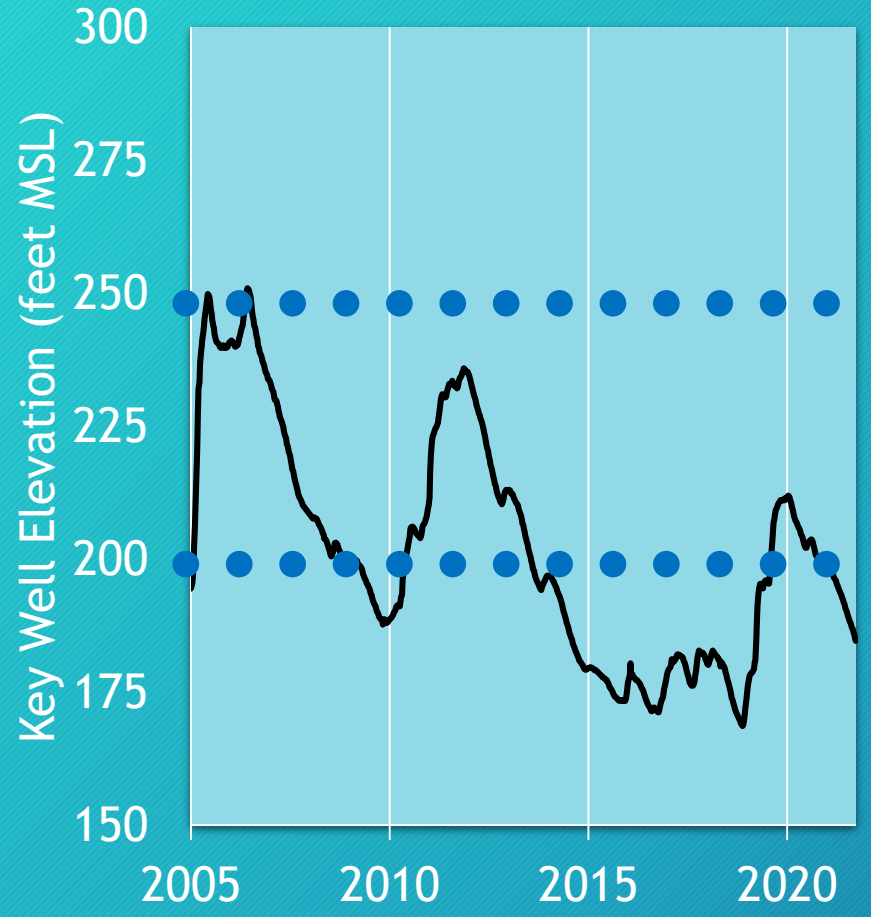
Recharge Sources



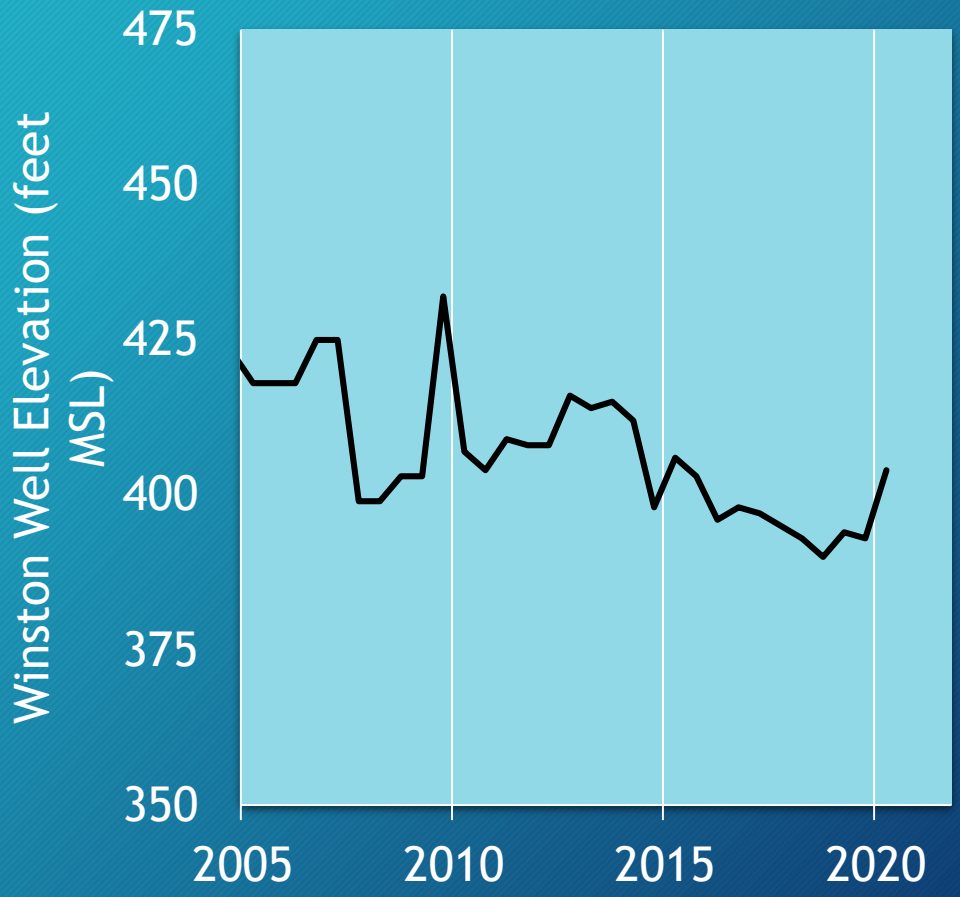
Unmet recharge needs since 2015

Water Level Changes in San Gabriel Valley

Main San Gabriel Basin

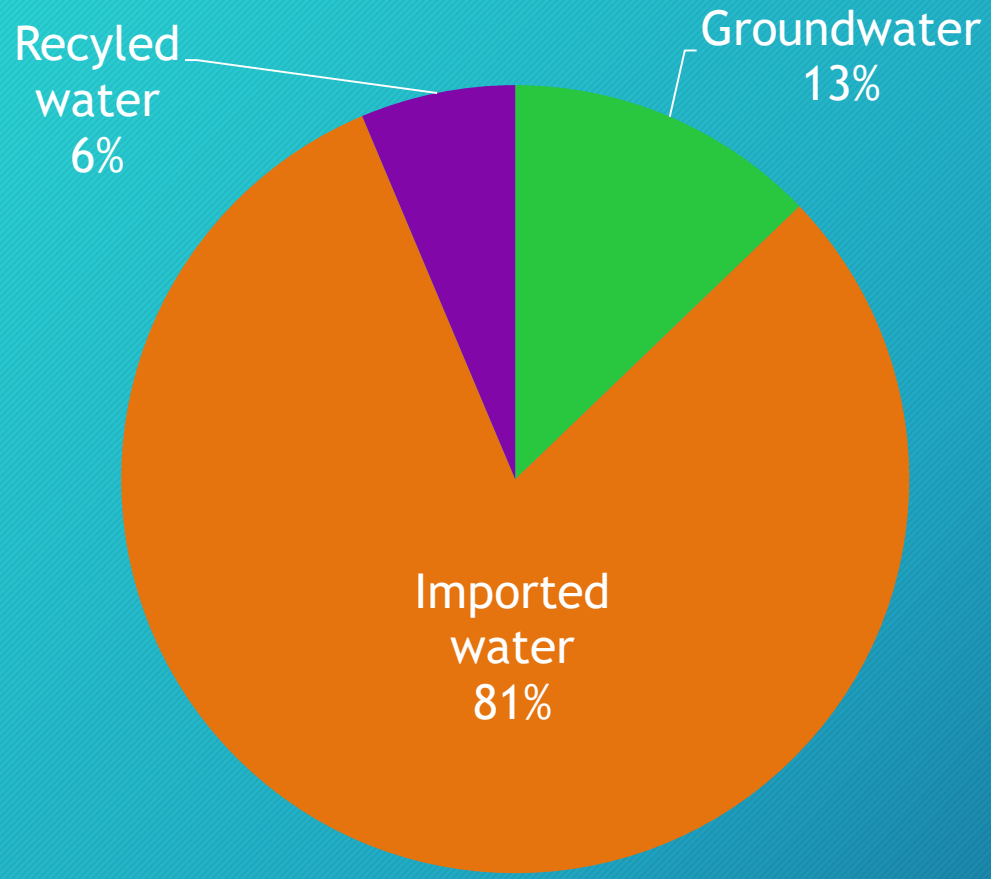


Raymond Basin

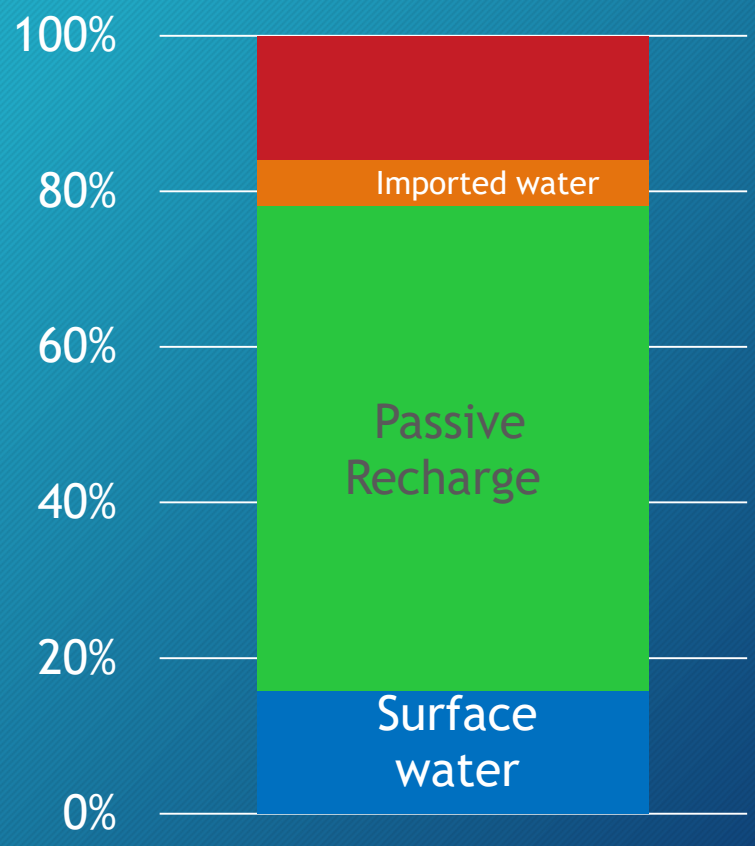


Upper LA River Area – Conditions Since 2015

Supply Sources

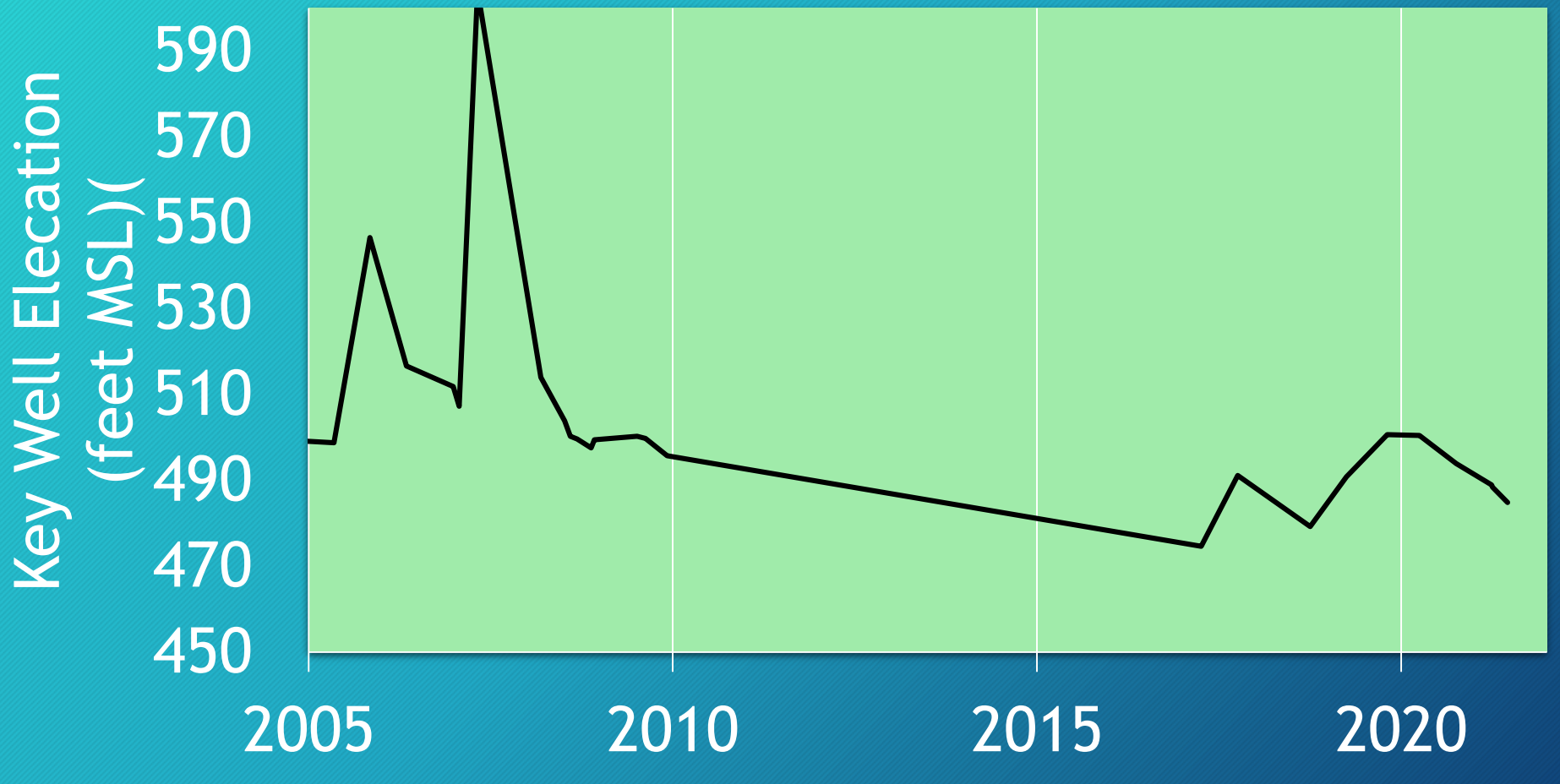


Recharge Sources



Significant unmet recharge needs since 2015

Water Level Changes in San Fernando Valley



Water percolates into ground and provides recharge to groundwater in San Gabriel Valley

Santa Fe Spreading Grounds above Santa Fe Dam

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