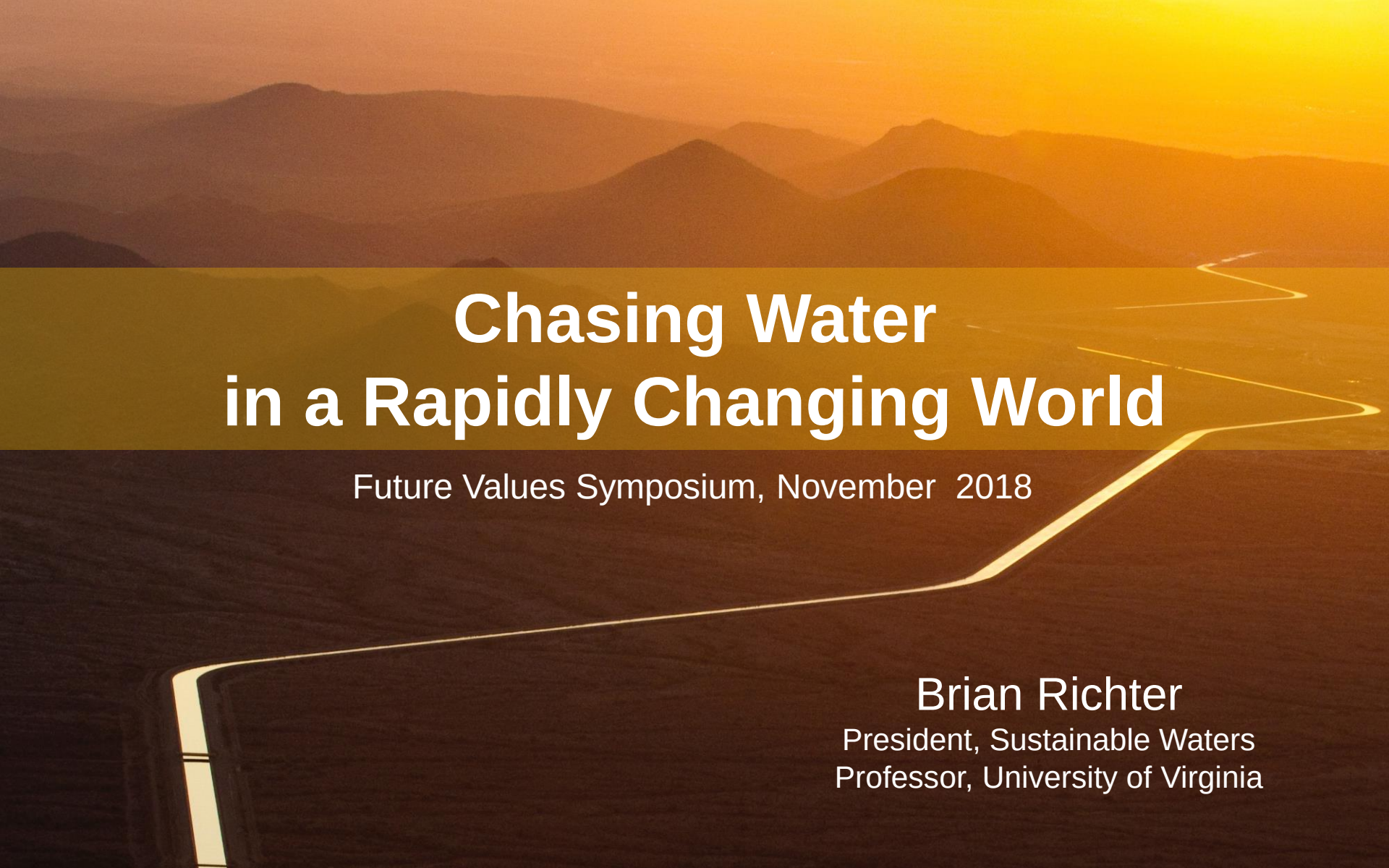
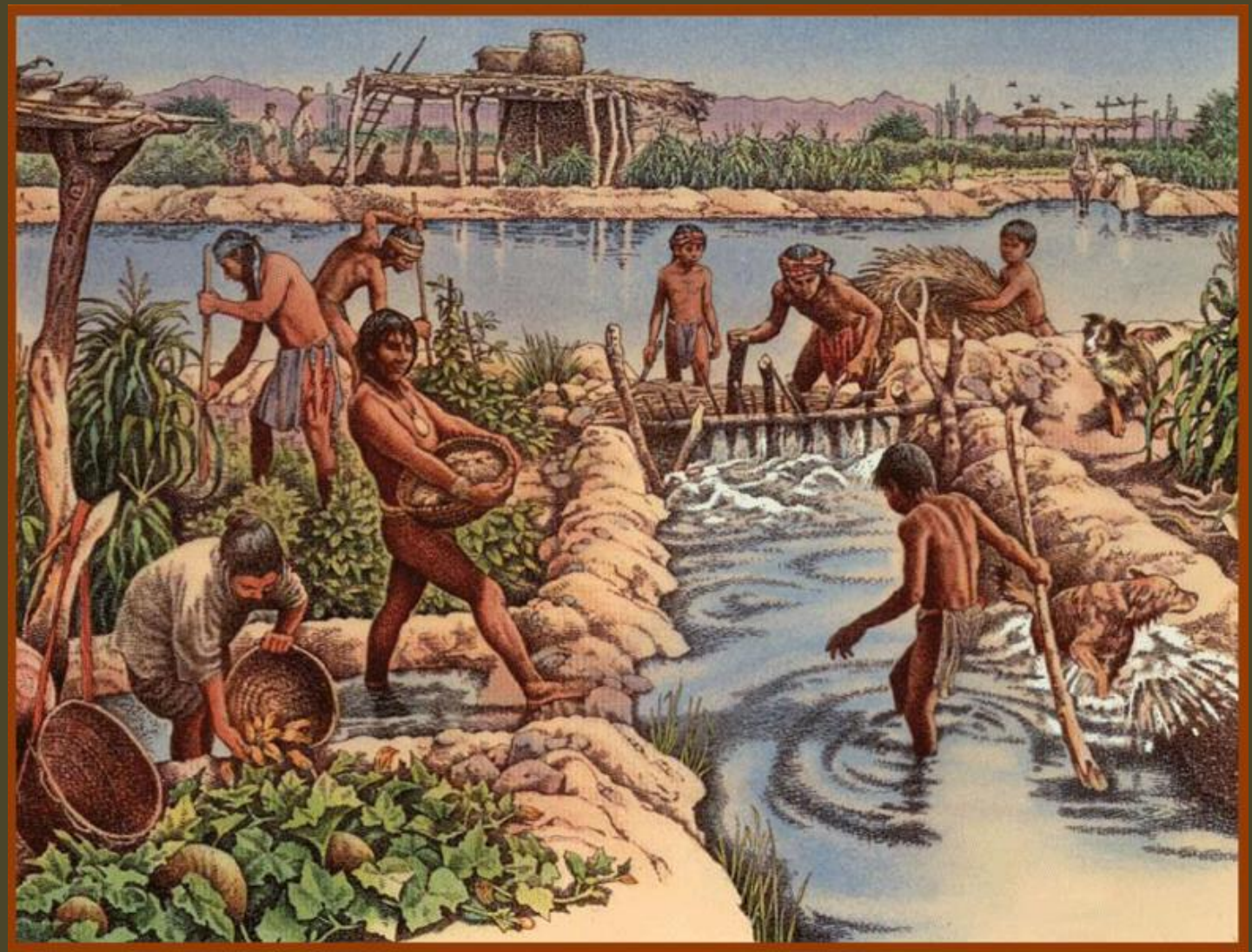


Chasing Water in a Rapidly Changing World

Future Values Symposium, November 2018

Brian Richter
President, Sustainable Waters
Professor, University of Virginia



Hoover Dam & Lake Mead

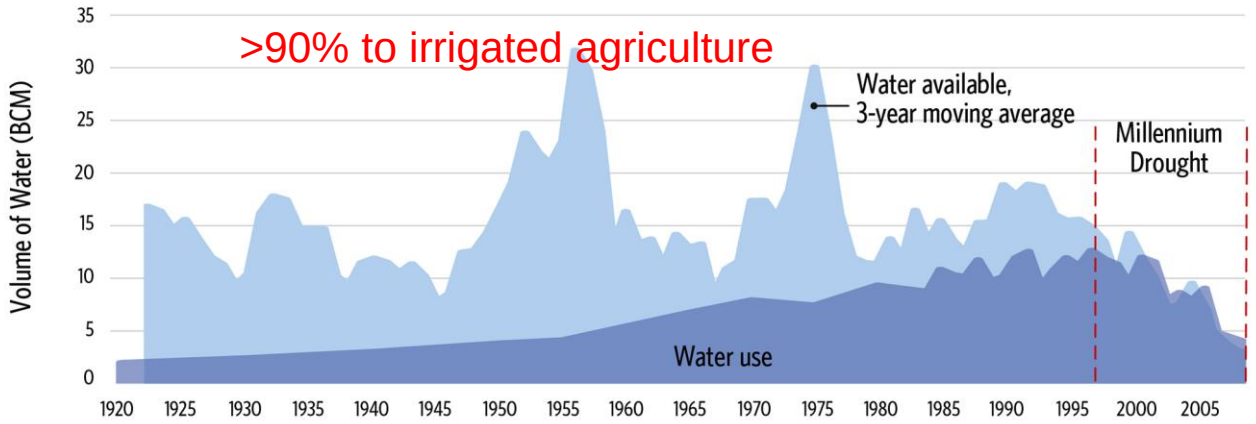
High Plains Aquifer, Kansas

South-North Water Diversion Project, China

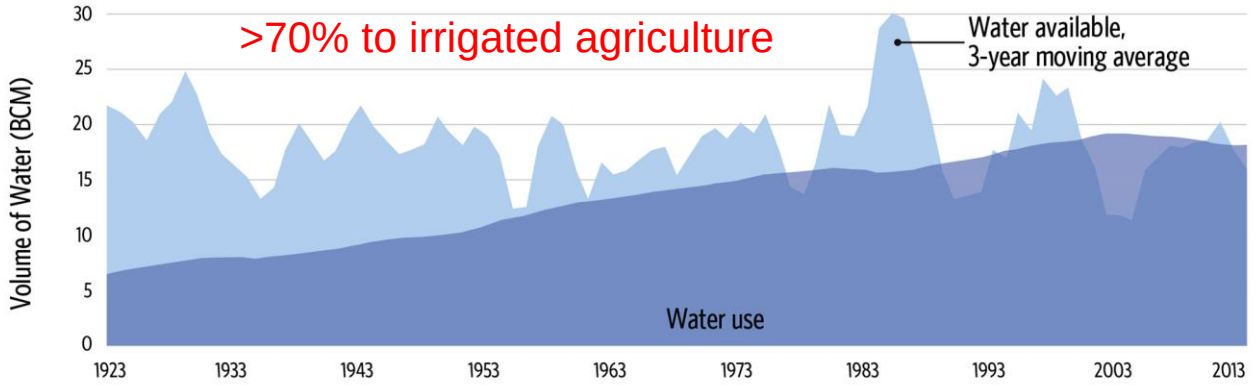
Imperial Irrigation District, California

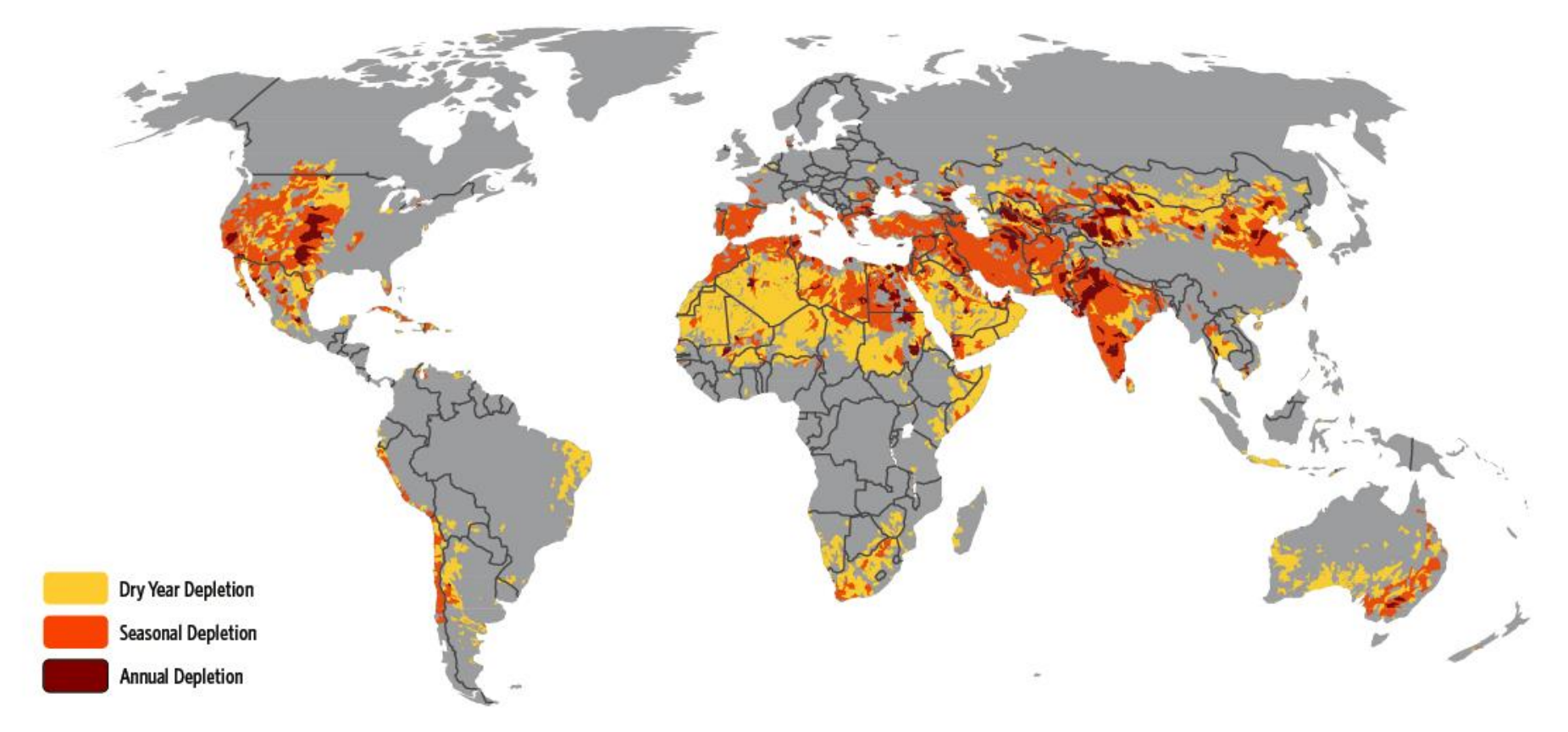
Phoenix, Arizona

Water availability and use in the Murray-Darling Basin of Australia



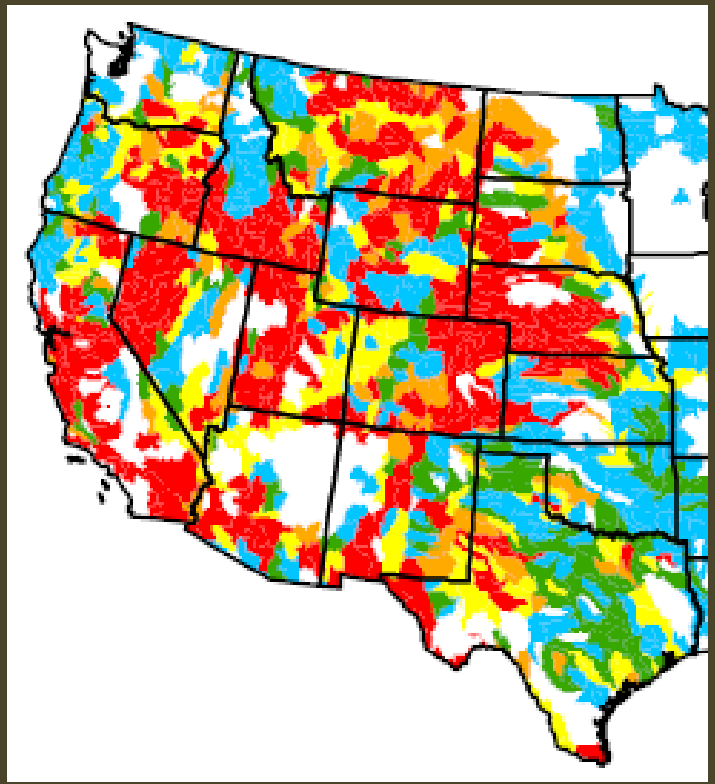
Water availability and use in the Colorado River Basin of the United States

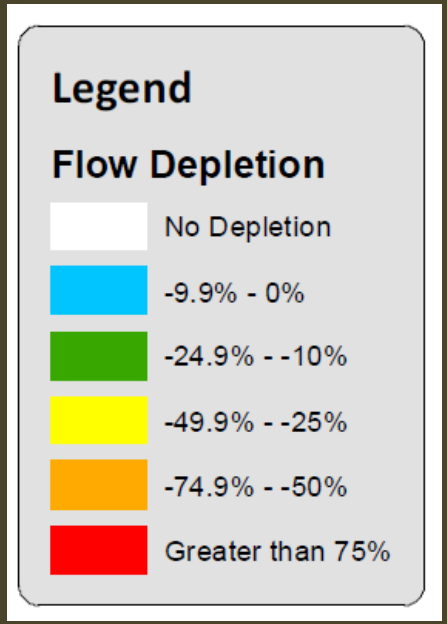




Water shortages are occurring in 1/3 of the planet's watersheds and aquifers
1/2 of the world's population is affected
3/4 of the world's irrigated acreage is affected

Water Flow Depletion in Summer



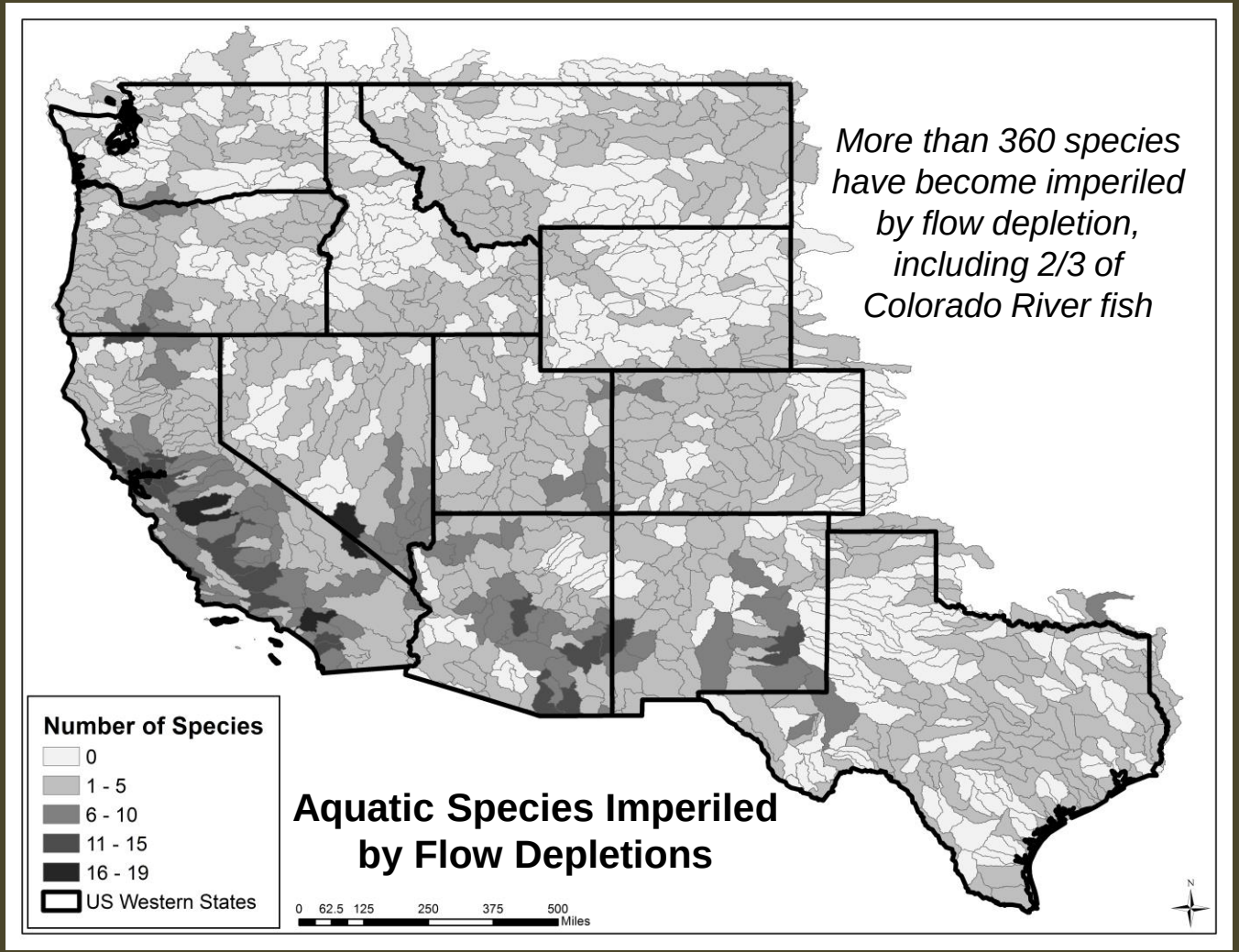


Half of Western rivers have lost half of their summer water
One quarter have lost more than 75%

So what?

Who gets hurt?

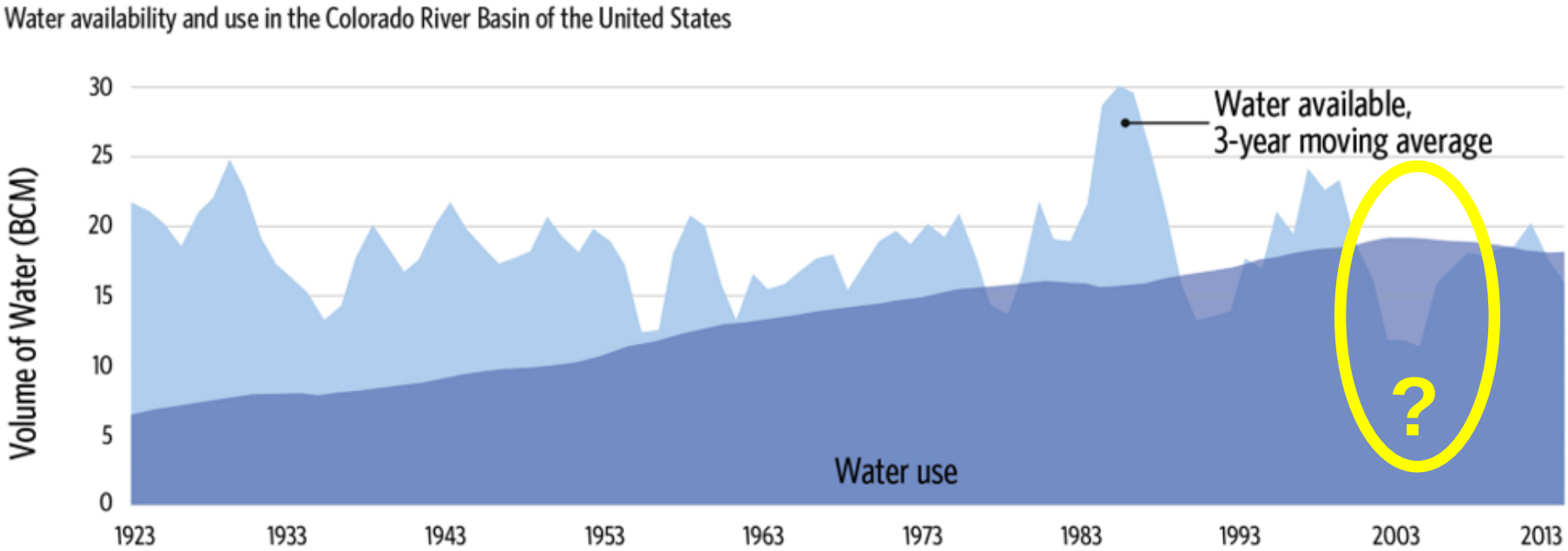
Mill Creek, Paradise Valley, MT


More than 360 species have become imperiled by flow depletion, including 2/3 of Colorado River fish
Number of Species
0
1 - 5
6 - 10
11 - 15
16 - 19
US Western States
Aquatic Species Imperiled by Flow Depletions
0 62.5 125 250 375 500
Miles
N

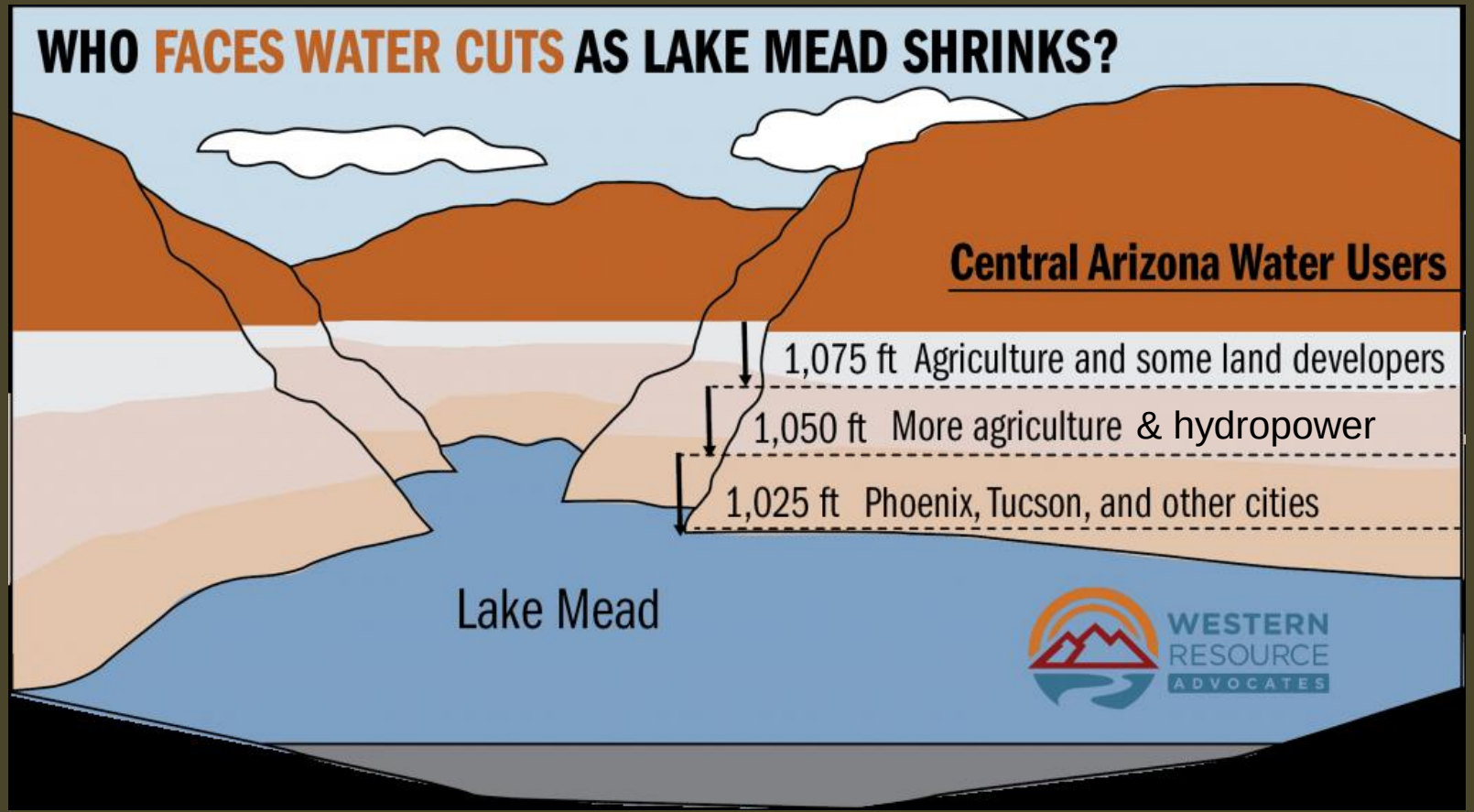
Who else gets hurt?

- Volume of water rights held
- Priority of water rights held
- Access to multiple, alternative water sources
- Ability to get by with less
- Financial ability to purchase more water

The story of the Colorado River…….



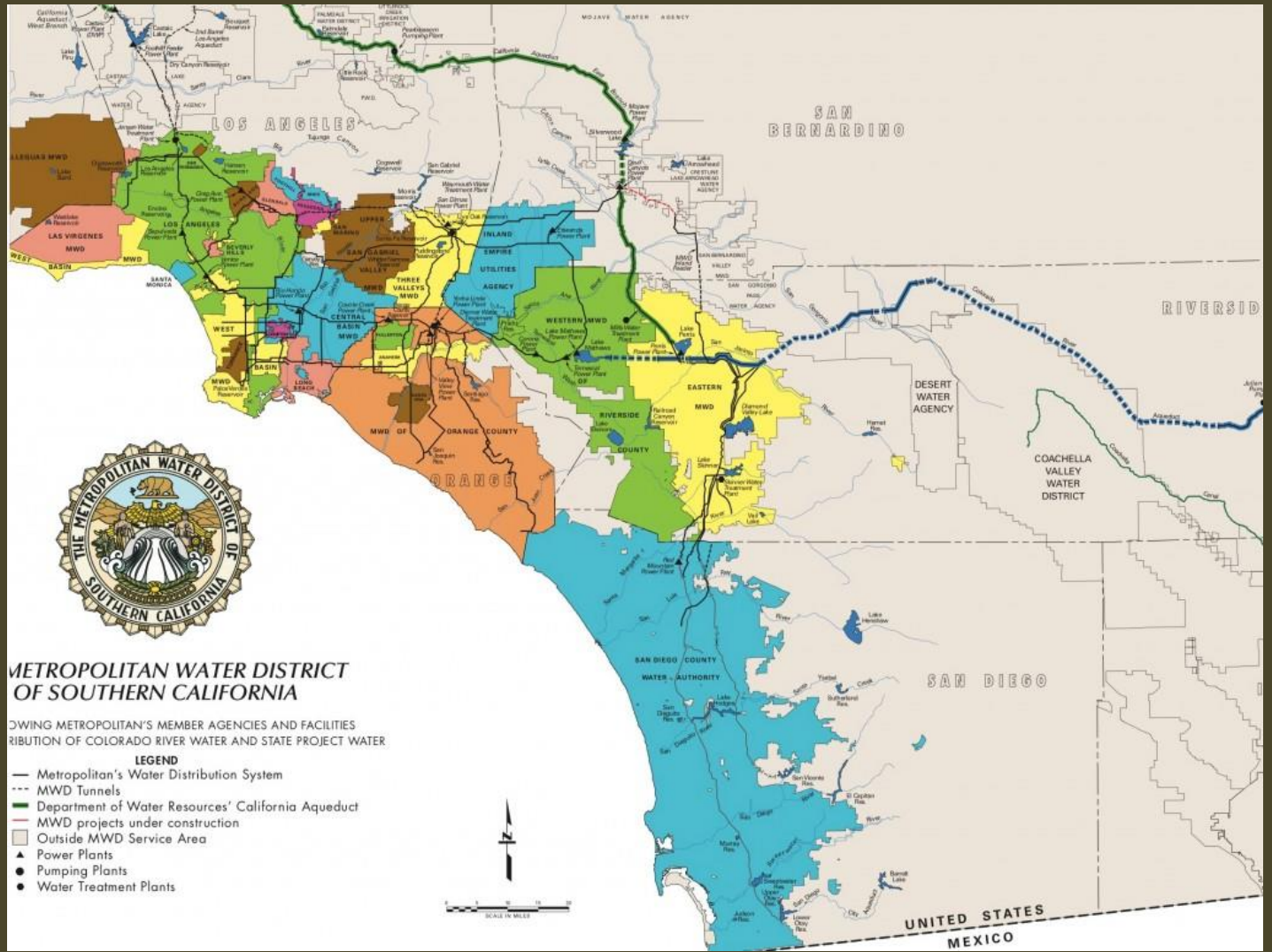
Hoover Dam & Lake Mead



80%

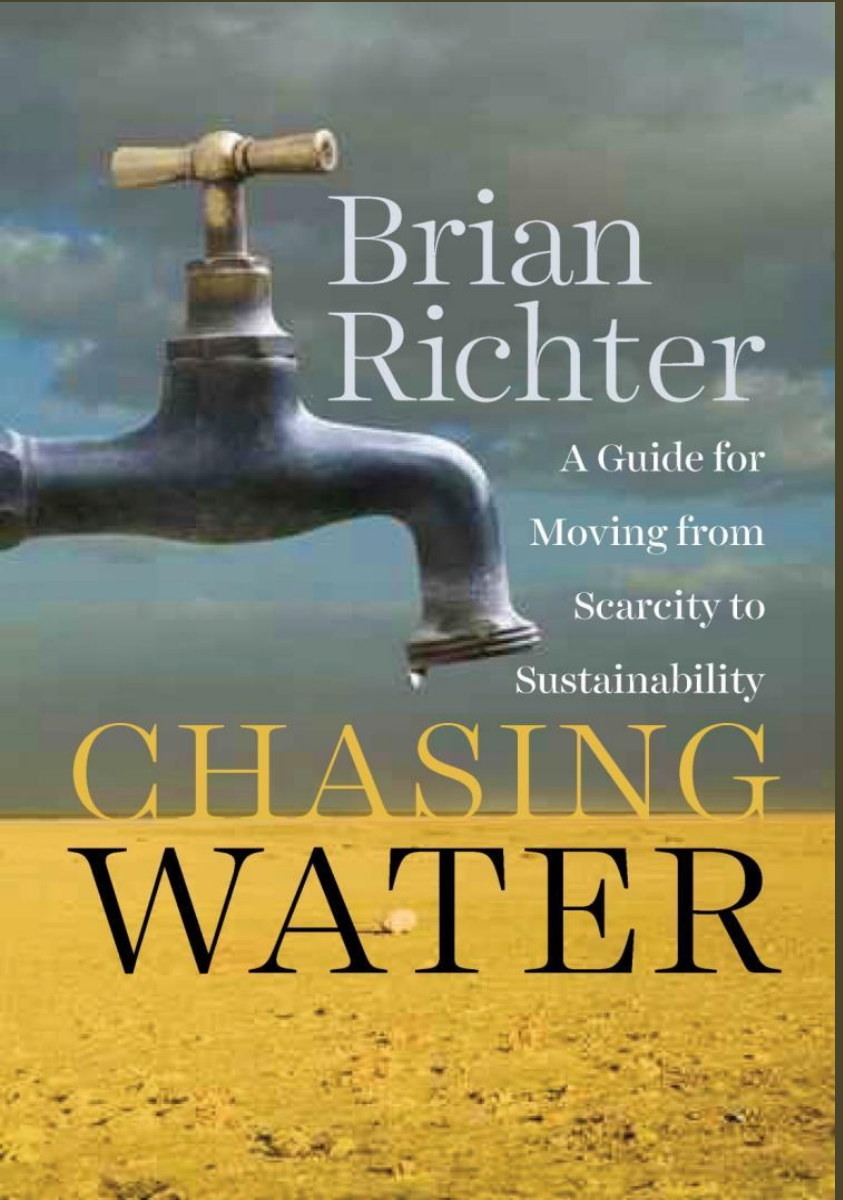
40%

Today's elevation = 1,078 ft


METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
OWING METROPOLITAN'S MEMBER AGENCIES AND FACILITIES
RIBUTION OF COLORADO RIVER WATER AND STATE PROJECT WATER
LEGEND
Metropolitan's Water Distribution System
MWD Tunnels
Department of Water Resources' California Aqueduct
MWD projects under construction
Outside MWD Service Area
Power Plants
Pumping Plants
Water Treatment Plants
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
ORANGE
SAN DIEGO
DESERT WATER AGENCY
COACHELLA VALLEY WATER DISTRICT
EASTERN MWD
WESTERN MWD
INLAND EMPIRE UTILITIES AGENCY
THREE VALLEYS MWD
CENTRAL BASIN MWD
WEST BASIN MWD
LONG BEACH
MWD OF ORANGE COUNTY
RIVERSIDE COUNTY
SAN DIEGO COUNTY WATER AUTHORITY
LAS VIRGENES MWD
CALLEGUAS MWD
SAN GABRIEL VALLEY MWD
SCALE IN MILES
UNITED STATES
MEXICO

21st Century Reality

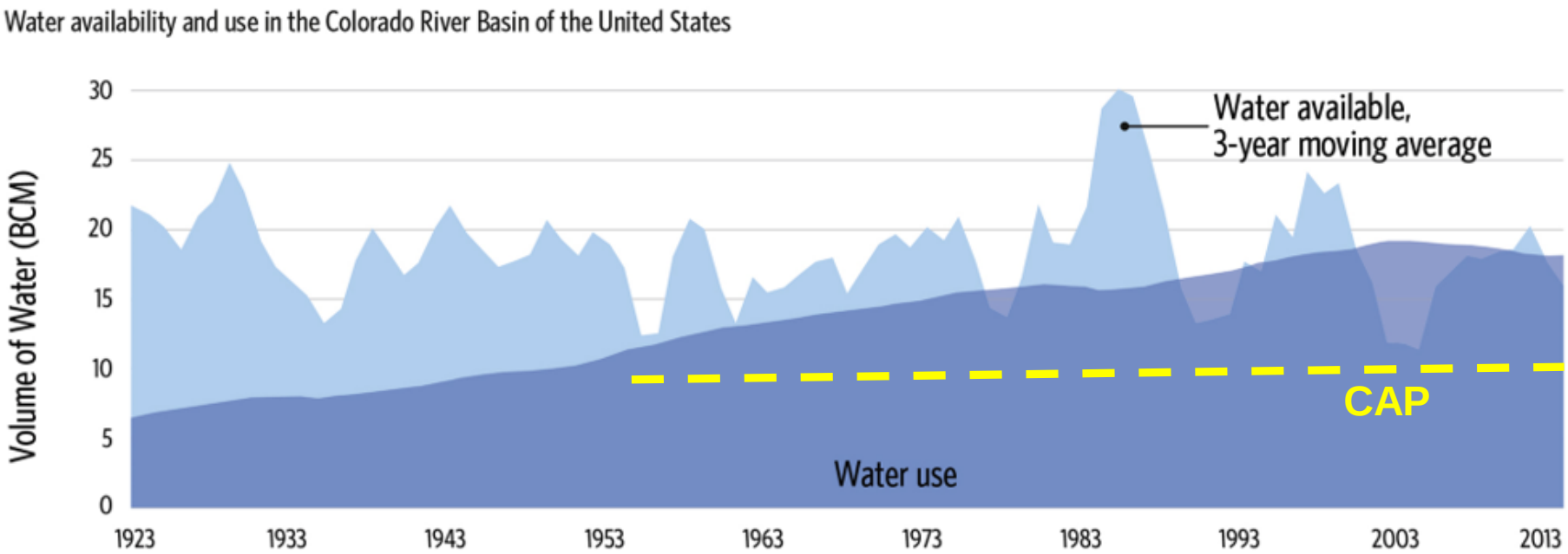
In water-scarce regions of the world, there is no more ‘surplus’ water



Three Steps Out of Water Scarcity:

- **Define a sustainable limit of water use (i.e., a cap)**
- **Freeze urban water footprints**
- **Reduce water consumption on farms**

Capping Water Consumption



Freezing the Urban Water Footprint Based on 2000-2015

	Population Growth
Denver	+17%
San Diego	+ 37%
Phoenix	+ 36%
Los Angeles	+ 19%
Las Vegas	+ 50%

Sources: USGS 2018 & water utility data

Los Angeles, California

Photo: LA Times

Sydney, Australia

Outdoor landscaping

Water-efficient toilets

Water reuse

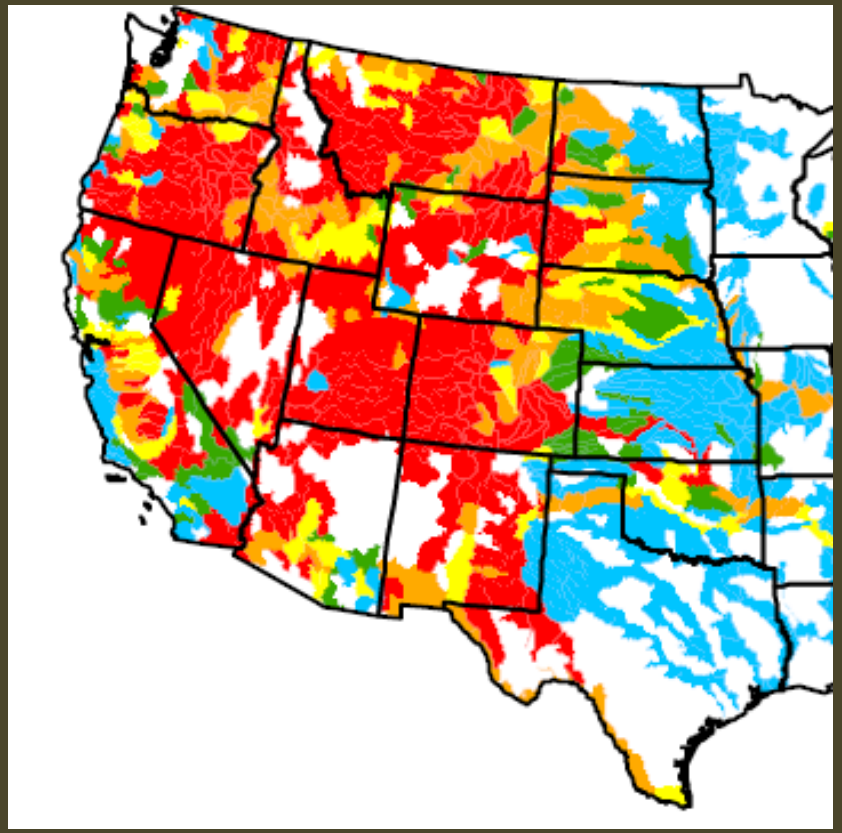
Los Angeles, California

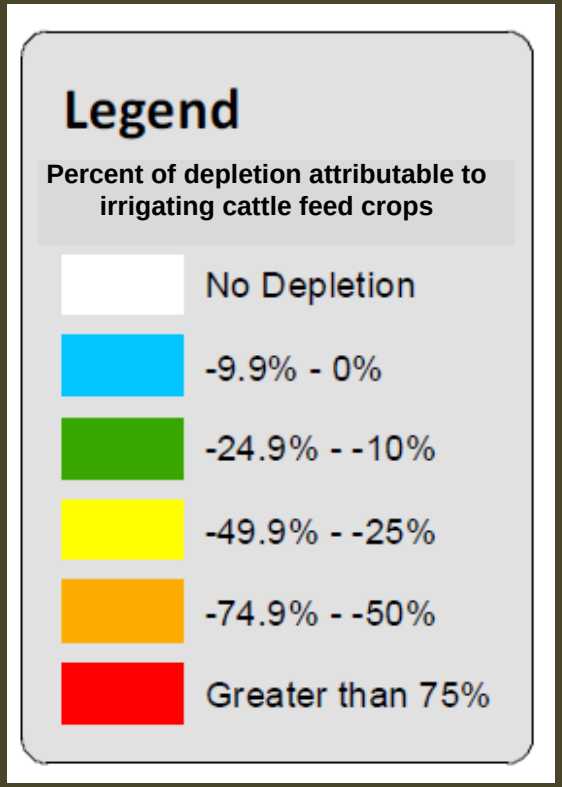
Desalination plant

Water for Agriculture in the Western US

Crop	Land Use	Water Consumption
Alfalfa	15%	23%
Corn grain	25%	18%
Grass hay	7%	10%
Cotton	7%	8%
Wheat	8%	8%

The Impact of Meat Production





The vast majority of irrigation water and associated stream depletion is going to irrigate cattle feed crops

Flood irrigation

Drip irrigation

Improvements in water application
34-57% savings in consumptive use

Enhanced soil health (including mulch or no-till)
13-54% savings in consumptive use

Alfalfa

Hemp

Saving water by crop shifting
54-87% savings in consumptive use

Temporary, rotational fallowing
95-100% savings in consumptive use

Potential Revenue Streams on Irrigated Farms

Farm lease 2-4%

Capital appreciation 3-4%

Short-term fallowing payments 2-4%

Long-term offtake water leases 5-12%

Sale of conservation easements 3-5%

Source: Water Asset Management LLC

Questions?