An Overview of the Colorado River

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Lower Colorado River
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The Colorado River has been described as “one of the most contested, recreated-upon, and carefully controlled rivers on Earth.”

Source: National Geographic?

Colorado River and Watershed

- The Colorado River runs over 1,400 miles from its origin in Colorado to the international border south of Yuma, AZ
- The watershed covers 238,600 miles^2 in the United States and an additional 7,400 miles^2 in Mexico
- The watershed had a population of 12.7 million in 2010, with Las Vegas and Phoenix being the biggest cities
- The Colorado basin states are some of the fastest growing states in the US

Colorado River and Watershed

- The watershed includes parts of 7 states (CO, WY, UT, NM, AZ, NV, and CA) and is divided into the Upper Basin and Lower Basin at Lee's Ferry, AZ
- The river and its tributaries are controlled by an extensive system of dams, reservoirs, and aqueducts, which divert 90% of its water in the U.S. alone to furnish irrigation and municipal water supply for almost 40 million people both inside and outside the watershed
- The river has not consistently reached the Gulf of California since the 1960s

Colorado River System
WYOMING
Flaming Gorge Reservoir
COLORADO
Denver
Salt Lake City
NEVADA
UTAH
Green River
Colorado River
Lake Powell
San Juan River
Lee Ferry
Virgin River
Lake Mead
Las Vegas
Little Colorado River
NEW MEXICO
Albuquerque
CALIFORNIA
Lake Mohave
Lake Havasu
ARIZONA
Los Angeles
Colorado R. Aqueduct
CAP Canal
Phoenix
Salton Sea
AAC
Gila River
San Diego
Morales Dam
Tucson
Upper Basin
Lower Basin
Dam Locations
Basin Divide
City
N
SNWA 10/98

Longest Tributaries

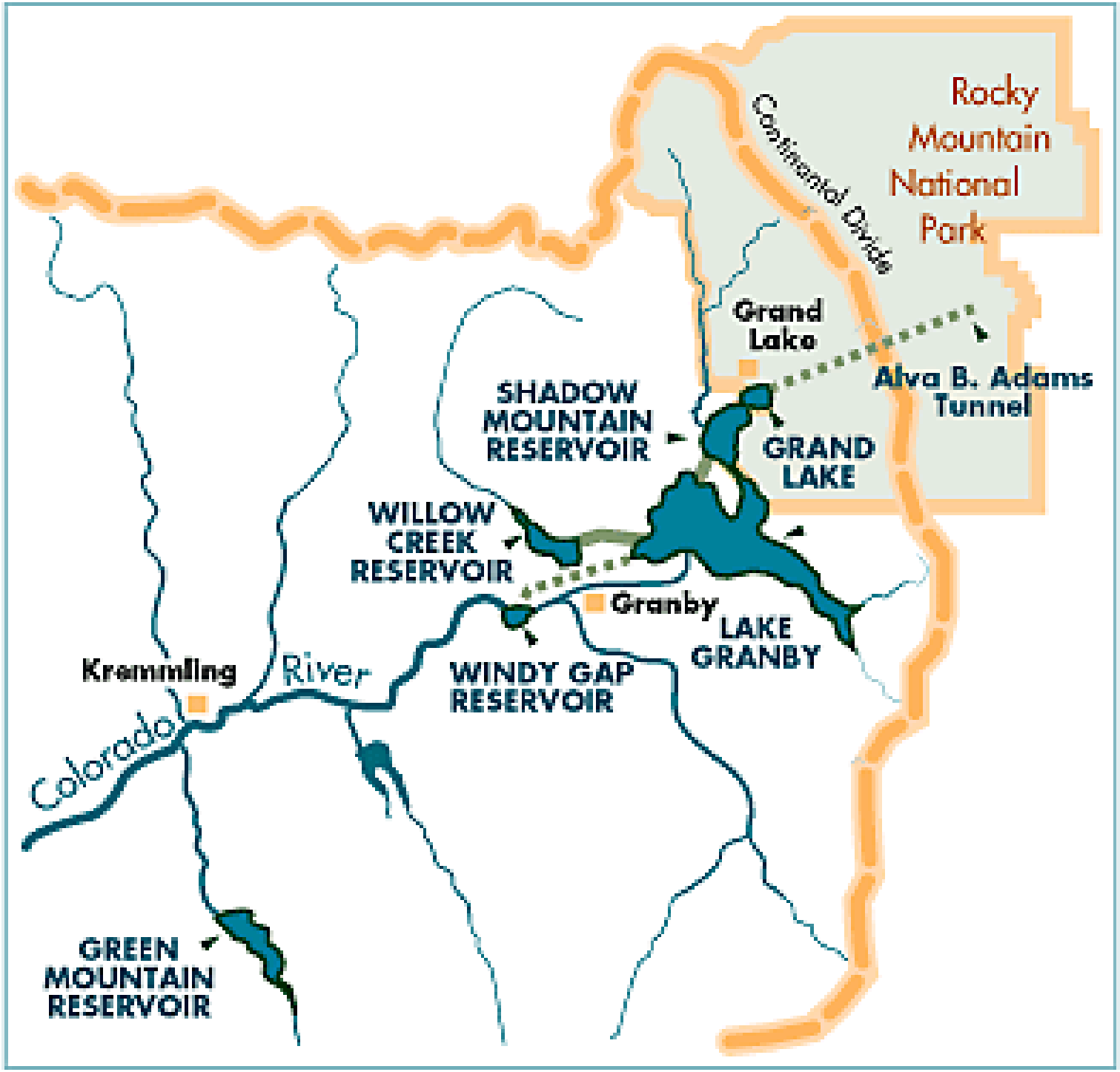
River	Length (mi)	Discharge (cfs)
Green (WY, CO, UT)	730	6,048
Gila (NM, AZ)	649	247
San Juan (CO, NM, UT)	383	2,192
Little Colorado (AZ)	356	424
Dolores (CO, UT)	250	633
Gunnison(CO)	164	2,570
Virgin (UT, NV)	160	239

Where Does It Originate?

- The Colorado River was formerly the river downstream of the confluence of the Green River and the Grand River in southeastern Utah
- The Grand River was renamed the Colorado River by an act of Congress in 1921 over the objections of Utah, Wyoming, and the USGS
- Current options:
  - Grand Lake, CO (elevation 10,184')
  - North Fork Colorado River (elevation >12,000' in Rocky Mountain National Park)

Grand Lake, CO (photo by Sarah Clements)

North Inlet above Grand Lake (photo by Sarah Clements)


Rocky Mountain National Park
Continental Divide
Grand Lake
Alva B. Adams Tunnel
SHADOW MOUNTAIN RESERVOIR
GRAND LAKE
WILLOW CREEK RESERVOIR
Granby
LAKE GRANBY
WINDY GAP RESERVOIR
Kremmling
Colorado River
GREEN MOUNTAIN RESERVOIR

Shadow Mountain Reservoir (photo by David Sisneros)

North Fork Colorado River above Shaadow Mountain Reservoir (photo by Sarah Clements)

Lake Granby (photo by Sarah Clements)

Tributaries and Reservoirs in Colorado

- North Fork Colorado River – Shadow Mountain Reservoir
- Colorado River – Lake Granby
- Willow Creek – Willow Creek Reservoir
- Frazier River – Windy Gap Reservoir
- Williams Fork River and Reservoir
- Troublesome Creek

Tributaries and Reservoirs in Colorado (Cont.)

- Muddy Creek – Wolford Mountain Reservoir
- Blue River – Dillon and Green Mountain Reservoirs
- Gunnison River – Taylor Park, Blue Mesa, and Morrow Point Dams
- Dolores River – McPhee Reservoir

Green River near Dinosaur Natl. Monument, CO/UT (photo by Doug Andersen)

Yampa River near Dinosaur Natl. Monument (photo by Doug Andersen)

Tributaries and Reservoirs in Utah

- Green River – Fontanelle Reservoir (WY) and Flaming Gorge Reservoir (UT)
  - Yampa River – CO/UT
- Duchesne River – Soldier Creek and Starvation Dams
- White River – Taylor Draw Dam (CO)
- San Juan River – Navaho Dam and Reservoir (CO/NM)

Tributaries and Reservoirs in Arizona

- Little Colorado River – Lyman Lake
- Bill Williams River – Alamo Lake
- Gila River – Painted Rock Reservoir

Colorado River Main Stem Reservoirs

- Lake Powell / Glen Canyon Dam (UT / AZ)
- Lake Mead / Hoover Dam (AZ, NV)
- Lake Mohave / Davis Dam (AZ, NV)
- Lake Havasu / Parker Dam (AZ, CA)
- Imperial Dam (AZ, CA)

Glen Canyon Dam (CR687.2)

Lee’s Ferry (CR687.2 = Compact Point)

The Law of the River

- Colorado River Compact (1922) – Divided water between upper (CO, NM, UT, WY) and lower (AZ, CA, NV) basin states
- Boulder Canyon Project Act (1928) – Authorized construction of Hoover Dam and set allocations for the 7.5 MAF allocated to the lower basin states
  - AZ=2.8 MAF, CA=4.4 MAF, NV=0.3 MAF
- California 7-Party Agreement (1931) – Allocated water to claimants in CA (Palo Verde ID, Yuma Project, IID, CVID, MWD, City and County of San Diego)

The Law of the River (Cont.)

- Supreme Court Decisions (1964 and 1979) – Settled disputes between AZ and CA and confirmed that the Colorado River Compact and Boulder Canyon Project Act had priority over later agreements
- Colorado River Basin Project Act (1968) – Authorized the construction of water development projects in the upper and lower basins, including the CAP
- The Criteria for Coordinated Long-Range Operation of Colorado River Reservoirs (1970, amended 2005) – provided for coordination of reservoir operations in both basins

The Law of the River (Cont.)

- Upper Colorado Basin Compact (1948) – Created the Upper Colorado Basin Commission and allocated the 7.5 MAF/yr for the Upper Basin States
  - CO=51.75%, UT=23%, WY=14%, NM=11.75% +50,000 AF/yr to AZ
- Colorado River Storage Project (1956) – Authorized construction of Glen Canyon, Flaming Gorge, Navajo, and Curecanti Dams

The Law of the River (Cont.)

- Mexican Water Treaty (1944) – Allocated 1.5 MAF/yr to Mexico
- Minute 242 of the US-Mexico International Boundary and Water Commission (1973) – Required the US to reduce the salinity of water delivered to Mexico from Morelos Dam
- Colorado River Basin Salinity Control Act – Authorized desalting and salinity projects to improve Colorado River water quality
- Minute 319 (2012) – Addressed flows to Mexico under shortage conditions

24.5 Mile Rapid (CR664.5)

60 Mile Rapid (CR628.8)

Little Colorado River (CR627.4)

Crystal Creek (CR591.0)

Deer Creek (CR553.2)

Havasu Creek (CR532.95)

Pearce Ferry (CR410)

Colorado River above Lake Mead (CR408)

Gregg Basin (CR394)

Temple Bar (CR380)

Virgin River Inlet, 2011 (~VR25)

Boulder Canyon downstream of the Narrows (CR360)

What Could Possibly Go Wrong?

~CR362

Allocations vs. Actual Flows

- Allocations were based on the assumption that the average reliable flow of the Colorado River was about 17-18 MAF
- Actual flows are variable – and the average is smaller
  - Average flow is about 14.9 MAF at Lee's Ferry (or less – University of Arizona uses 13.5 MAF)
  - Historical range at Topock is 0.31 MAF in 1935 to 278 MAF in 1884
  - Recent range is 3.8 MAF in 2002 to 22.2 MAF in 1984

Hoover Dam (CR342.2)

Shortage Conditions

- Interim Guidelines (December 2007)
- Specifies reductions in releases to Lower Basin states based on Lake Mead surface elevation
  - Light Shortage (1050'-1075') - deliveries reduced to 7.167 MAF
  - Heavy Shortage (1025'-1050') – deliveries reduced to 7.083 MAF
  - Extreme Shortage (1000'-1025') - deliveries reduced to 7.000 MAF

Downstream from Davis Dam (CR276.0)

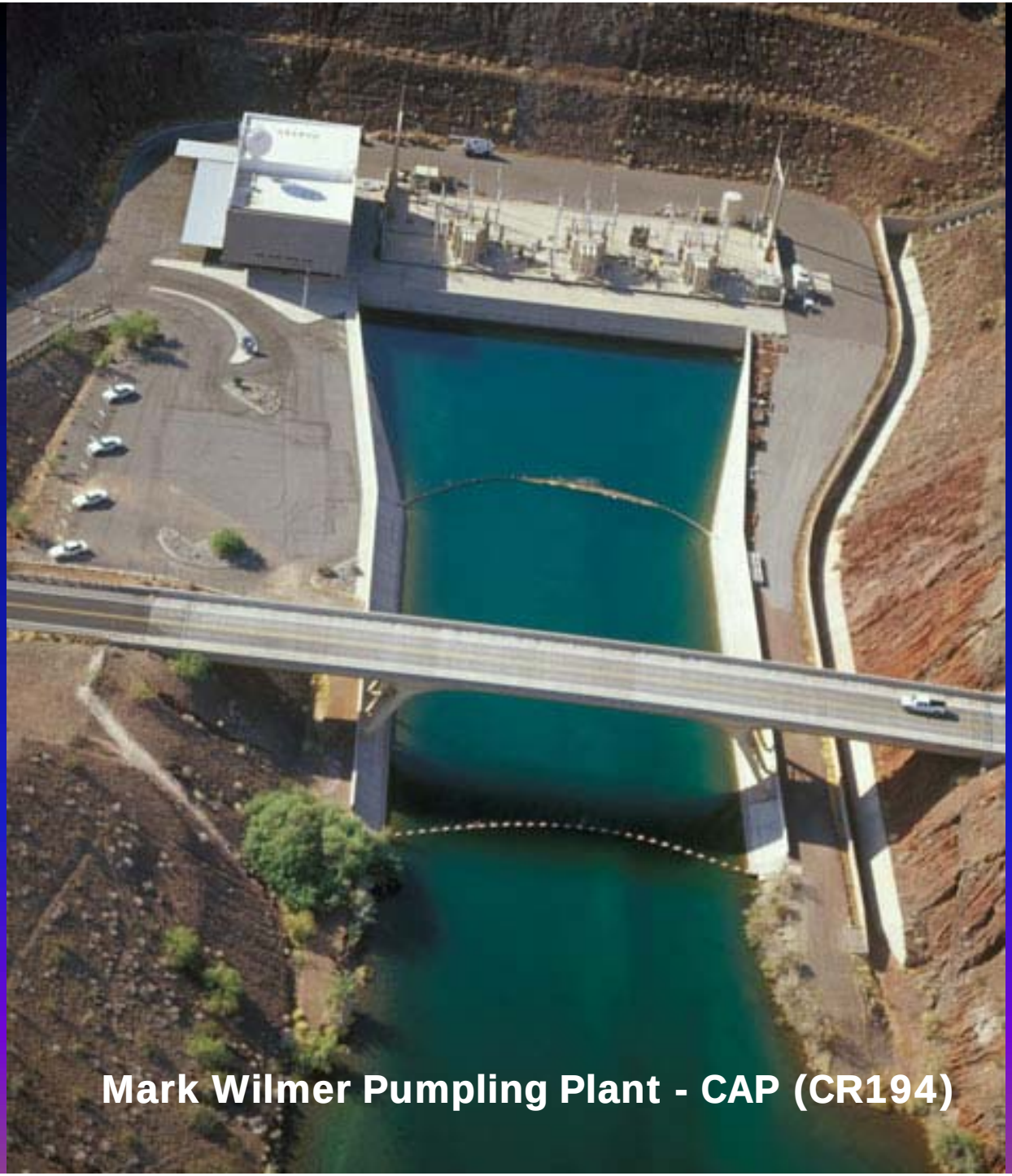
Colorado River at RailRoad Bridge near I-40 (CR233.96)

Topock Gorge (~CR230)

Major Diversions

- Colorado River Aqueduct – Operated by MWD to provide water to Southern California
- Central Arizona Project – Largest and most expensive aqueduct system in the US, supplies water to central and southern Arizona
- Imperial Diversion/All-American Canal – Largest irrigation canal in the world, feeding the Imperial Valley and 9 cities
- Morelos Dam (CR22) – Diverts most of remaining flow to Mexico

MWD Whitset Intake – Colorado River Aqueduct (CR194.3)


Mark Wilmer Pumpling Plant - CAP (CR194)

Parker Dam (CR192.3)

Cibolla NWR looking downstream (CR92)

Imperial Dam (CR49.2)

All-American Canal (CR49.2)

Summary

- The River and its tributaries are controlled by an extensive network of dams, reservoirs, canals, and aqueducts, which divert over 90% of its water
- Water from the Colorado River is used by approximately 40,000,000 people for municipal water supplies and irrigation
- The watershed includes 11 National Parks and is heavily used for recreation
- The Southwestern US could not have developed as it did without the Colorado River