



— BUREAU OF —
RECLAMATION

Upper Colorado River Basin Consumptive Use and Loss Reporting

*Colorado River Basin Data and Modeling
Second Roundtable*

May 27, 2020

Consumptive uses and losses overview

Reports are prepared pursuant to the Colorado River Basin Project Act of 1968, Public Law 90 537. The act directs the Secretary of the Interior to:

"make reports as to the annual consumptive uses and losses of water from the Colorado River System after each successive 5 year period, beginning with the 5 year period starting October 1, 1970. Such reports will be prepared in consultation with the States of the Lower Basin individually and with the Upper Colorado River Commission and will be transmitted to the President, the Congress, and to the Governors of each State signatory to the Colorado River Compact."



Consumptive uses and losses overview

- Only consistent accounting process conducted across the entire Colorado River Basin
- Critical data used to estimate historical natural flow
 - Foundational data for basin wide operation and planning studies
- Records of diversions and return flows are not complete enough to allow direct calculation of consumptive water use.
 - Theoretical and indirect methods of estimating consumptive use must then be relied upon
- Data available at a monthly, 8 digit HUC/county level
 - Aggregation and disaggregation techniques used to achieve this scale for each category

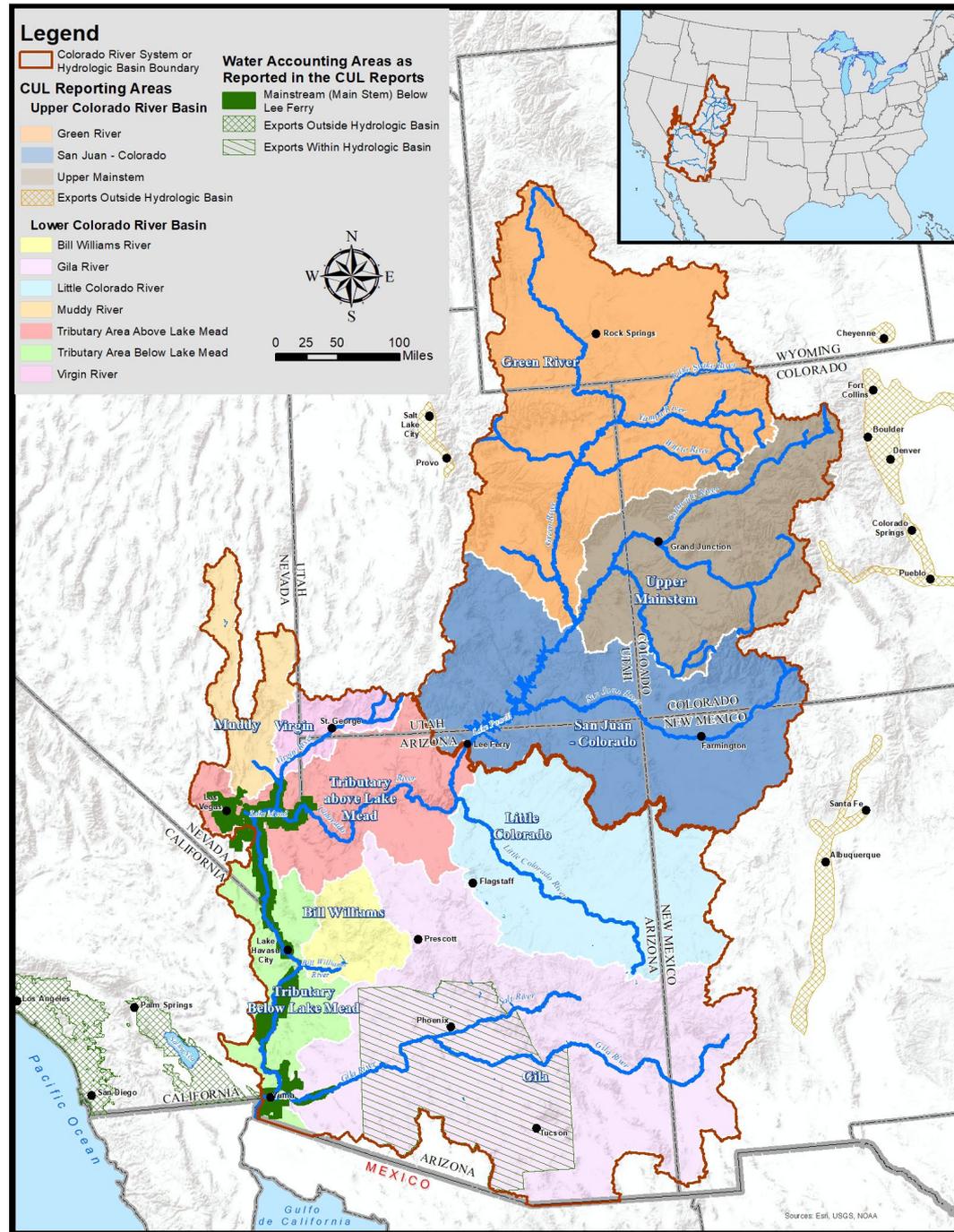


Upper Colorado River Basin Reporting Areas

Green River
(Wyoming, Colorado, Utah)

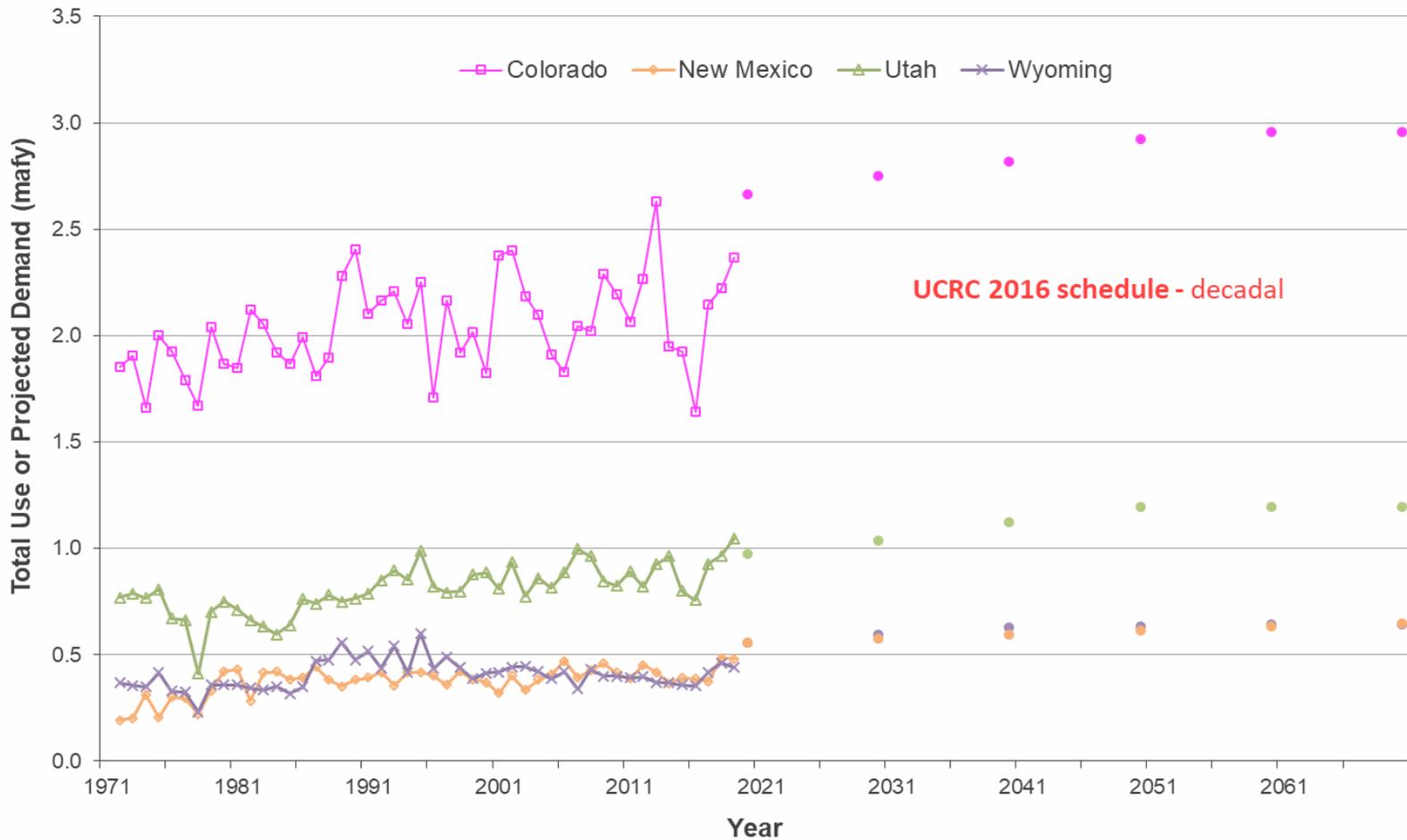
Upper Main Stem
(Colorado, Utah)

San Juan – Colorado
(Colorado, New Mexico,
Utah, Arizona)



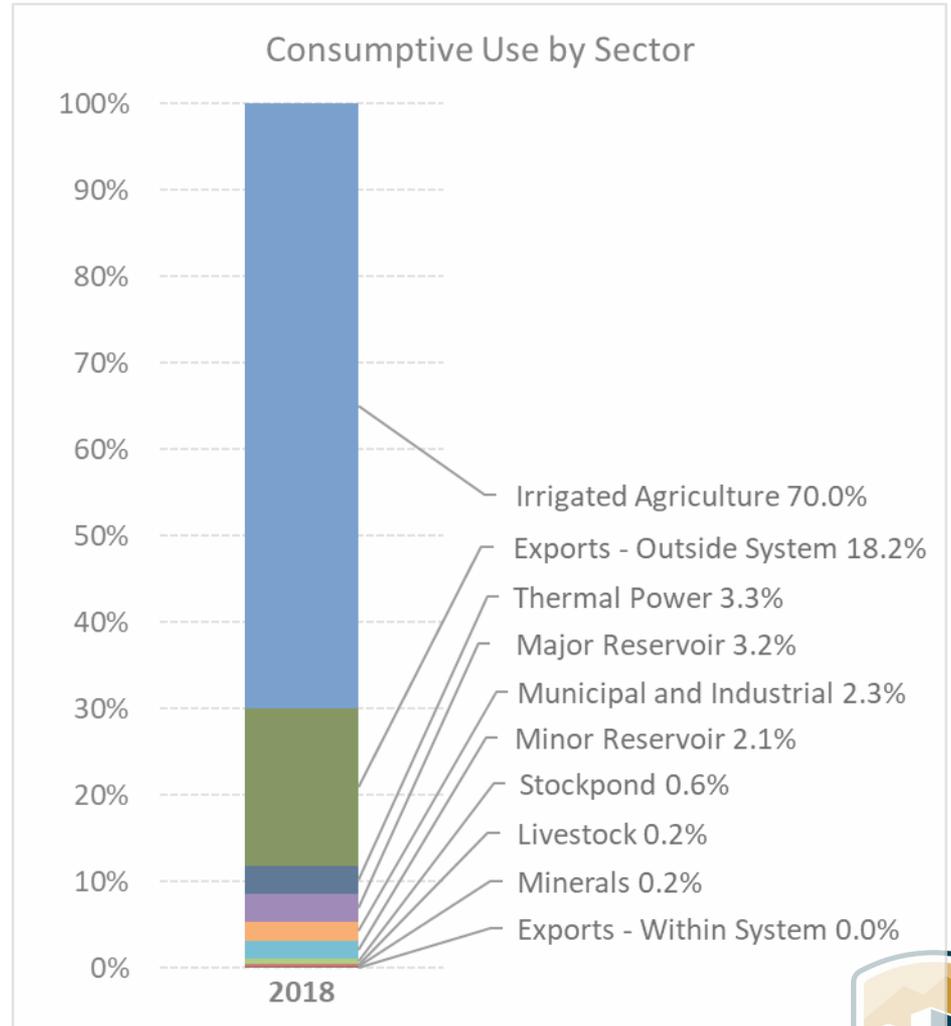
Historical Use and Projected Demands

Upper Basin States Consumptive Use And Projected Demands
excludes CRSP reservoir evaporation



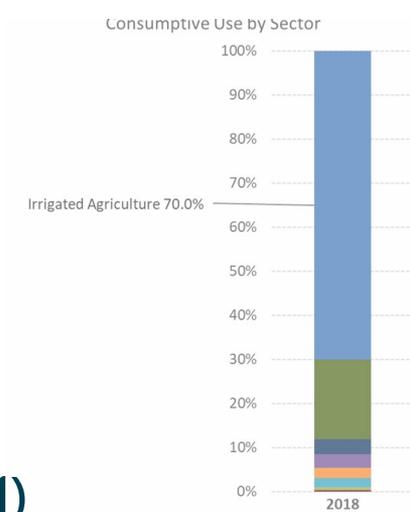
Categories Reported

- Irrigated Agriculture
- Reservoir Evaporation
- Stockponds
- Livestock
- Thermal Power
- Minerals
- Municipal and Industrial
- Exports
 - Within System
 - Outside System



Irrigated Agriculture

- **Current Estimation method**
 - Modified Blaney-Criddle evapotranspiration (TR No. 21)
 - Irrigation CU rate applied to irrigated acres to compute total CU
- **Sources for acreage estimates**
 - State Agriculture Statistics (yearly)
 - National Census of Agriculture Statistics (every 5 years)
 - Beginning to use Crop Land Data Layer available from NASS
 - GIS data (approximately every 5 years)
 - Available for Colorado, Utah, and Wyoming



Reporting Net Irrigated Agricultural Use =
Irrigated CU – Shortage + Incidental Losses



Upper Basin Shortage Lands

- Consumptive use calculations assume full water supply
- Estimated about 37% of the irrigated lands in the Upper Basin receive less than a full supply in average year
 - either due to lack of distribution facilities or junior water rights.
- The degree of shortages varies widely from year to year, depending upon precipitation and the magnitude of runoff.
- A selected stream gauging station within each subbasin is used as an index to select the date at which consumptive use calculations should be terminated
- Gauges and percent shortage are based on data from the 1971 Comprehensive Framework Study
 - Working to update this procedure
 - Could rely on diversion and return flow data if measured



Incidental Consumptive Use

- The Comprehensive Framework Study indicated incidental consumptive use of water associated with irrigation varied between 5 and 29 percent of the irrigation consumptive
- A percentage is assigned to each subbasin to determine net irrigated agricultural use



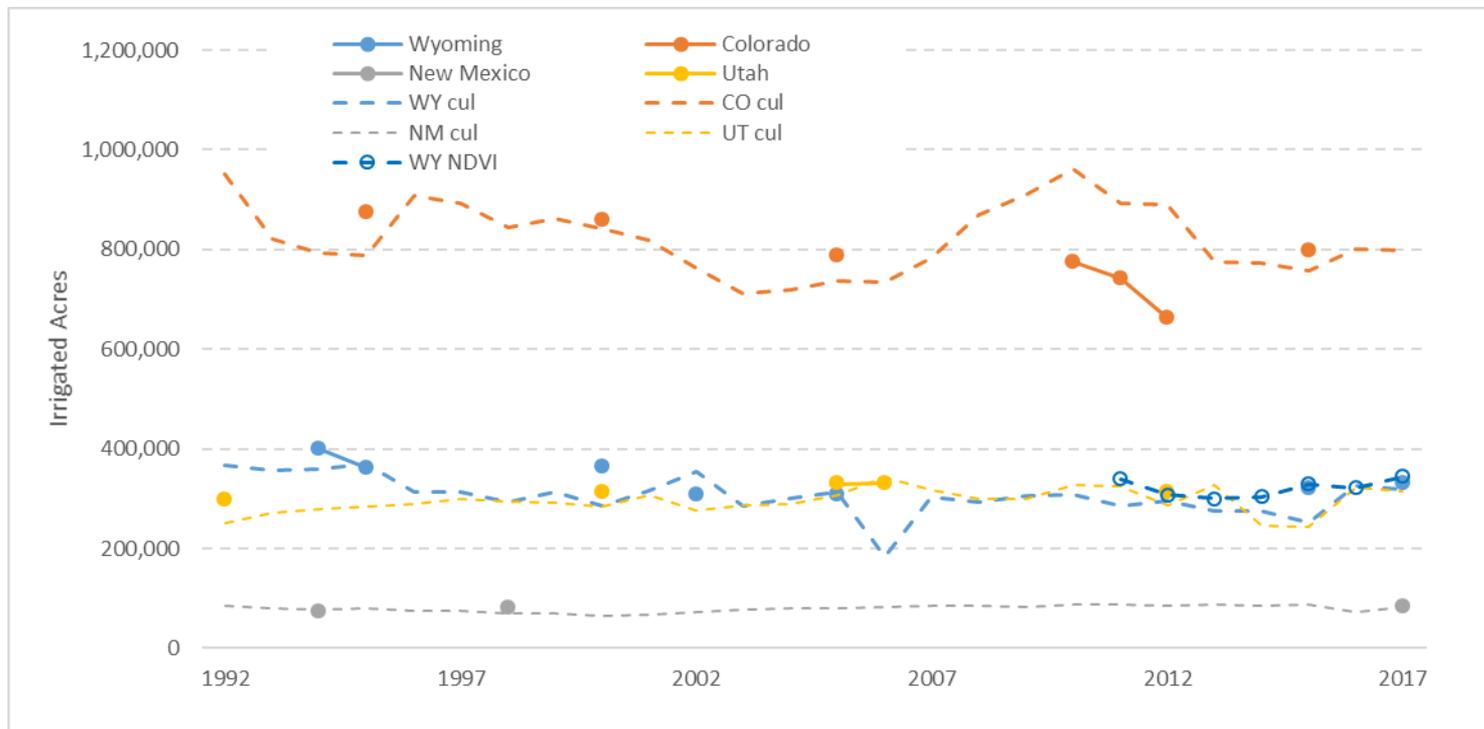
Advancing Agricultural ET estimation

- Reclamation and the Upper Colorado River Commission initiated a study in 2012
- In 2016 began intercomparing basin wide remote sensing for irrigated agriculture actual evapotranspiration (ET)
 - Applying METRIC and SSEBop
 - Compared 2017 and 2018
 - Will compare 2019
- Along with methods to estimate potential ET
 - ET Demands
 - Modified Blaney Criddle with an elevation adjustment
- Planning an OpenET Use Case Study with NASA this year
 - Adding ALEXI-DisALEXI, PT-JPL, and SIMS
 - Will compare 2017-2019



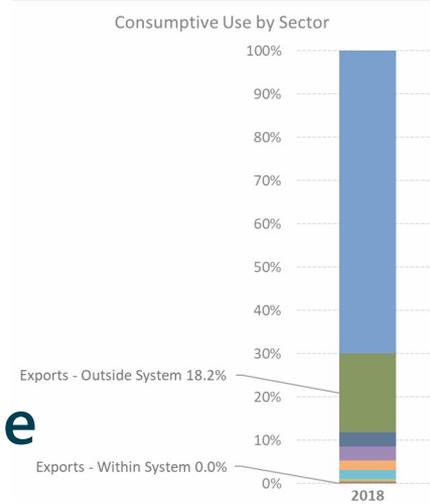
Exploring irrigated acreage identification

- Reclamation historically relied on GIS, State Ag Statistics, and Census of Agriculture data
- Exploring NDVI based approaches



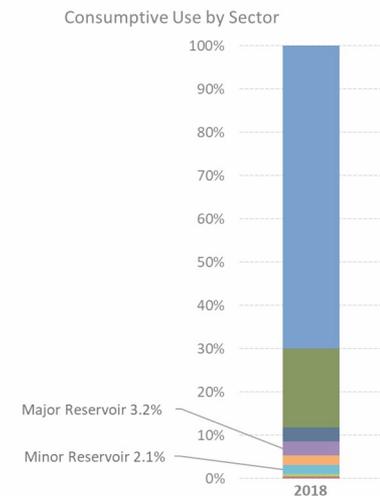
Exports

- Exports are divided into two categories: **Outside System and Inside System.**
 - The Outside System category includes water that is removed from the Colorado River basin.
 - The Inside System category includes water that is moved between reporting areas but does not leave the Colorado River basin.
- Most exports were measured and reported by the USGS or local water commissioners and users. The remainder were estimated on the basis of past records and capacity of facilities.
 - Many Utah and Wyoming exports are estimated from past records



Reservoir Evaporation

- Major reservoirs (41 reservoirs)
 - Monthly content records available.
 - Average monthly water surface area was determined



Major Reservoir Evaporation= Surface Area * Evaporation Rate

- Minor reservoirs (1000+ reservoirs)
 - For reservoirs lacking records, a “fullness factor” was estimated on the basis of reservoir use and historical hydrologic conditions.
 - These factors were applied to the surface area at total capacity.
 - “fullness factor” taken from the Comprehensive Framework

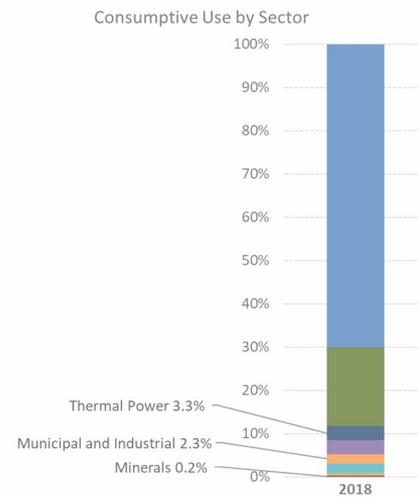
Minor Reservoir Evaporation=

Greater of (Salvage or Precip) - Free Water Surface
Evaporation Rate * Reservoir Surface Area



Municipal And Industrial

- Divided into 3 categories:
 - Thermal Electric Power
 - Other (urban, rural and industrial)
 - Mineral
- Thermal electric power water consumptive use, as available collected directly from powerplant operators.
- Other and Mineral consumptive use data collected by the USGS and summarized in the Estimated Use of Water in The United States in 1995 and 2000.
 - Reclamation is exploring updated data released in the recent USGS Colorado River Basin focus study
 - USGS is committed to increasing the frequency and spatial scale of their reported data



Data sharing

- Reclamation's CUL data and modeling is still performed in Excel spreadsheets
 - Data is shared through Excel workbooks
 - Data development performed across 50+ workbooks
- Would like to move to a relational database
 - Lack database expertise and funding
 - Seeking simpler data sharing and visualization

