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RECLAMATION

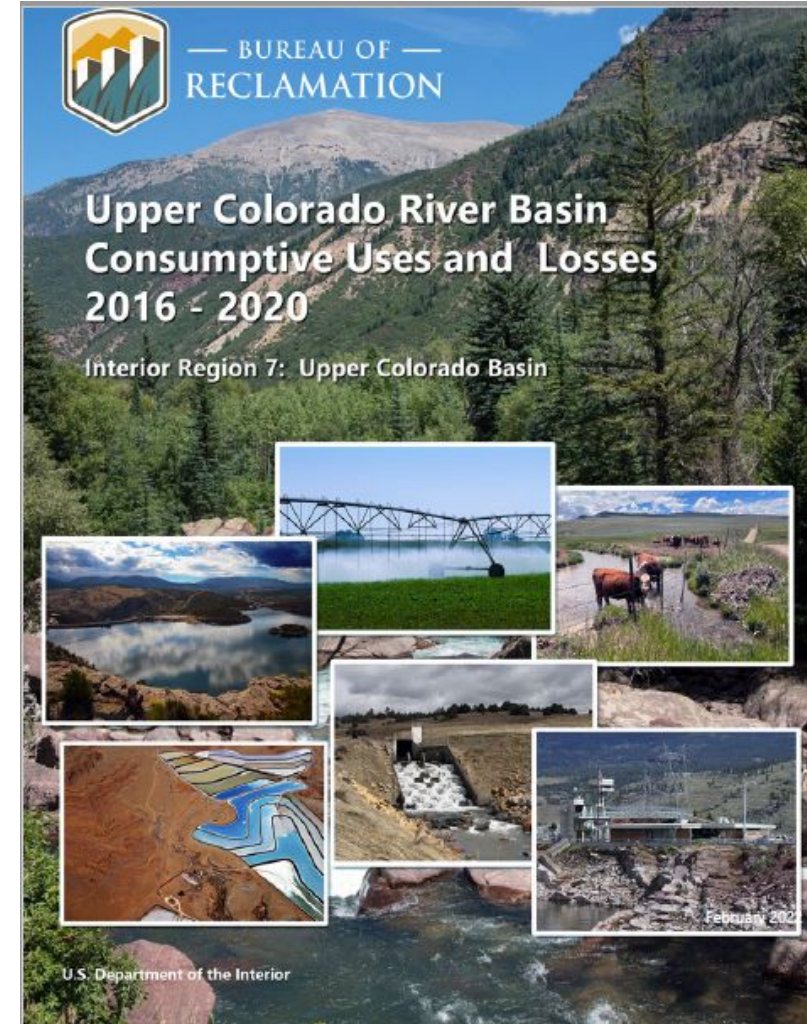
Upper Colorado River Basin Consumptive Use and Loss Reporting

National Water Use Data Workshop

August 25, 2022

Background

- Reclamation has been reporting consumptive uses and losses (CUL) since 1971
- Reports prepared pursuant to the Colorado River Basin Project Act of 1968, Public Law 90 537
- Provides the only consistent method to estimate CUL across the four Upper Division States
- Data available monthly at 8 digit HUC/county level
- Critical for long-term planning studies in the basin

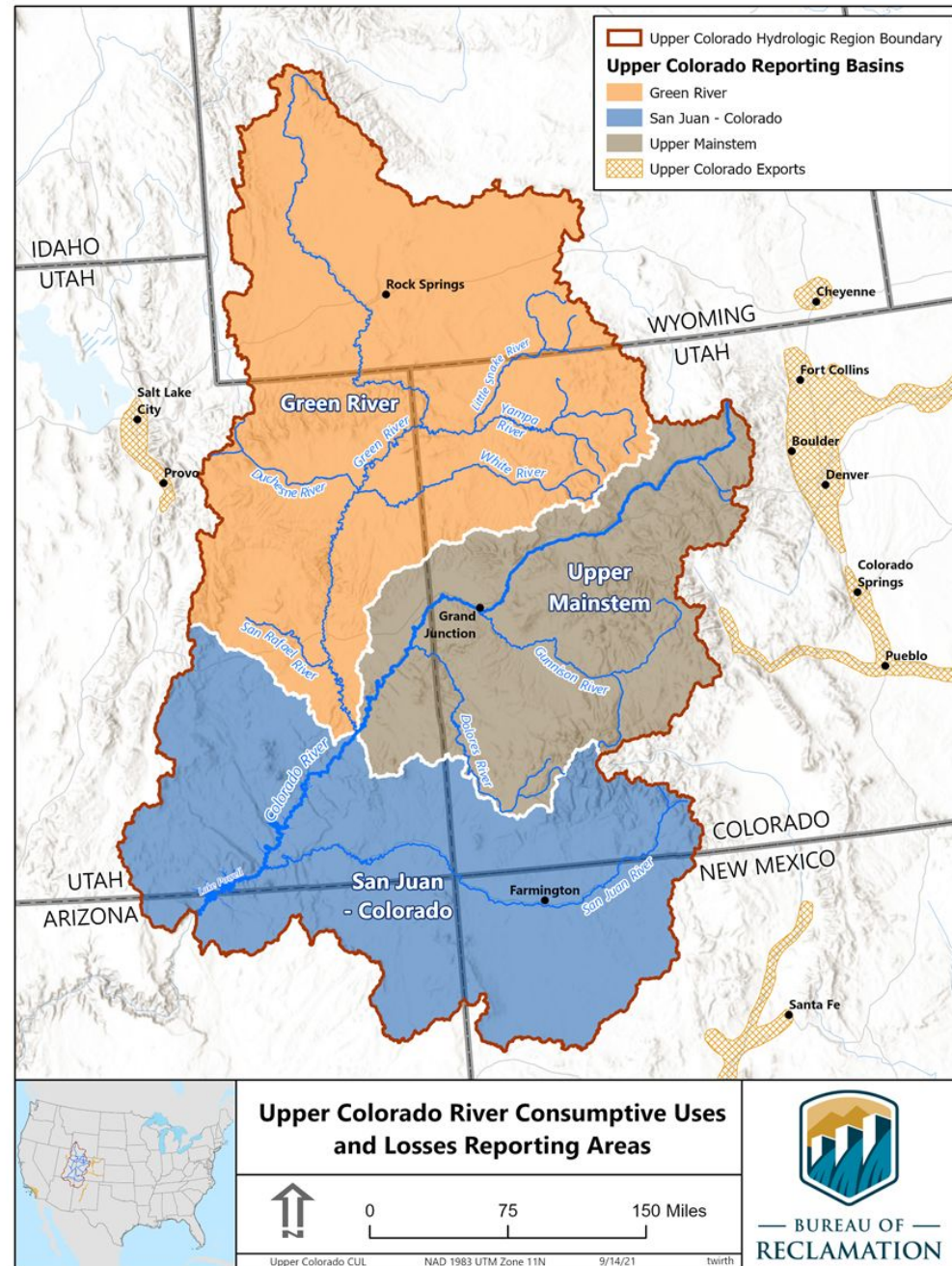


Upper Colorado River Basin Reporting Areas

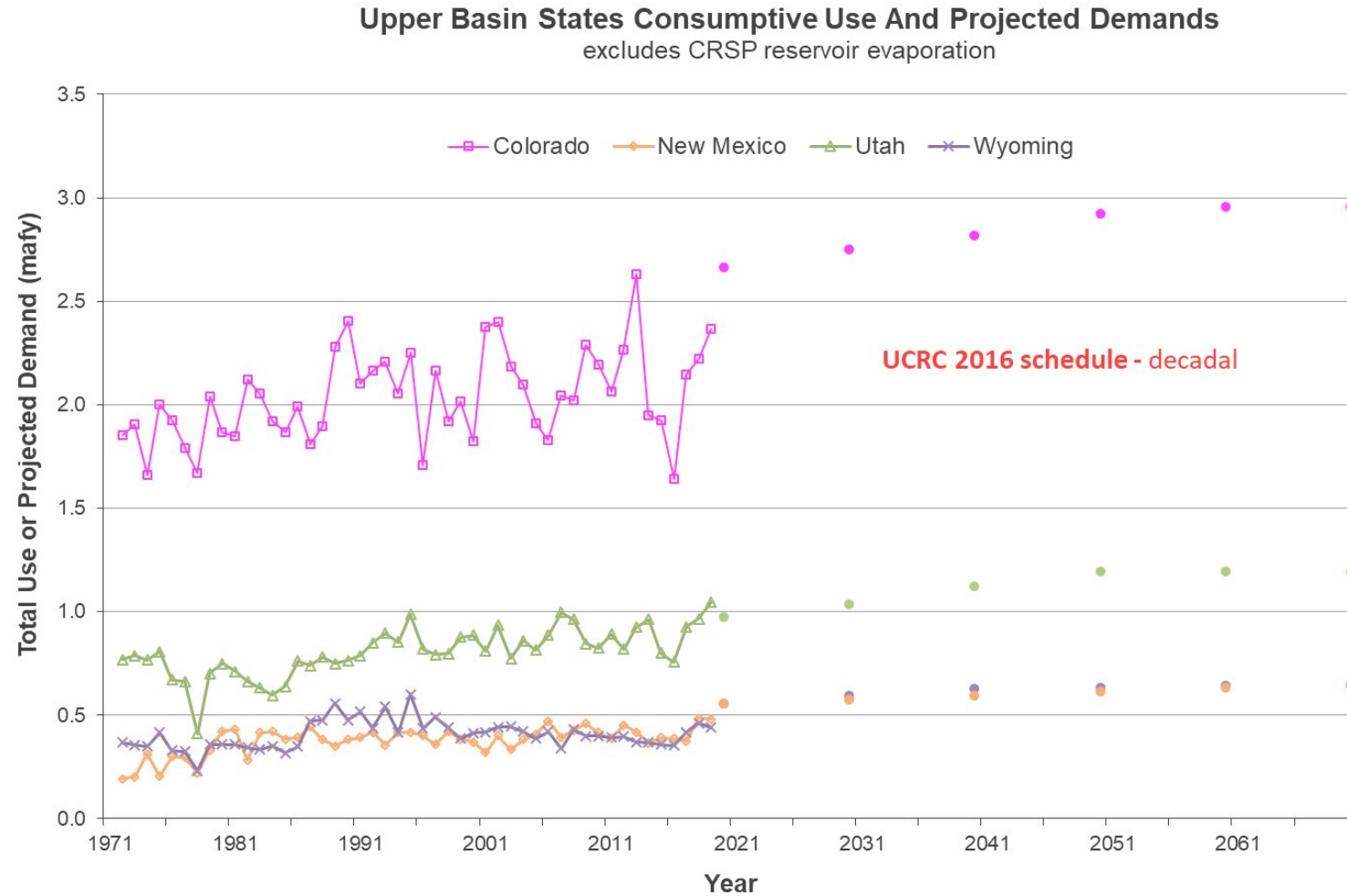
Green River
(Wyoming, Colorado, Utah)

Upper Main Stem
(Colorado, Utah)

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



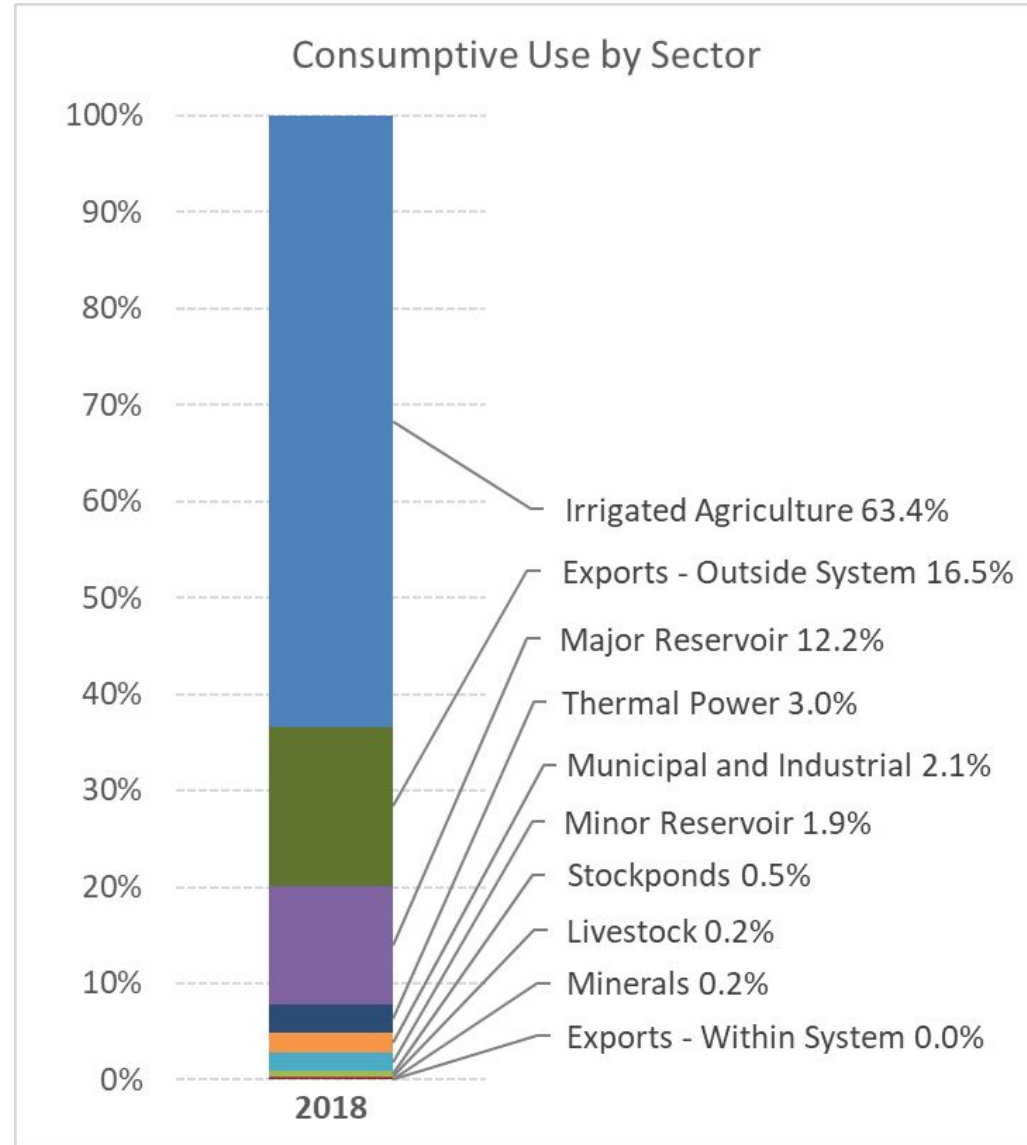
Historical Use and Projected Demands



Categories Reported

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

92% in three largest categories

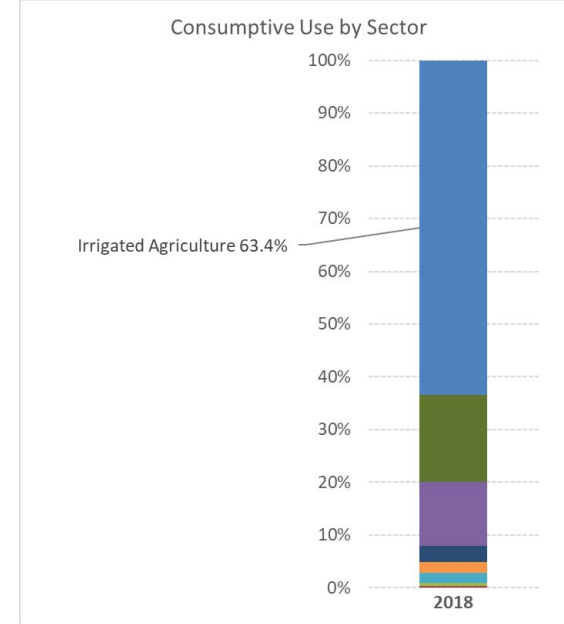


Irrigated Agriculture (63%)

- 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

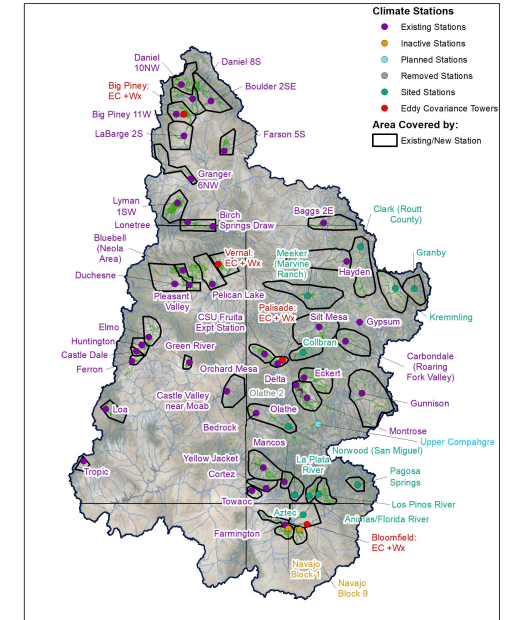
Reporting Net Irrigated Agricultural Use =

Irrigated CU – Shortage + Incidental Losses

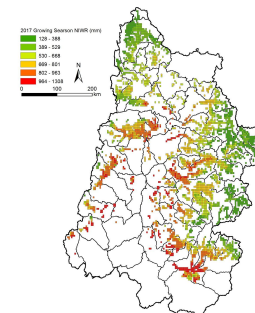
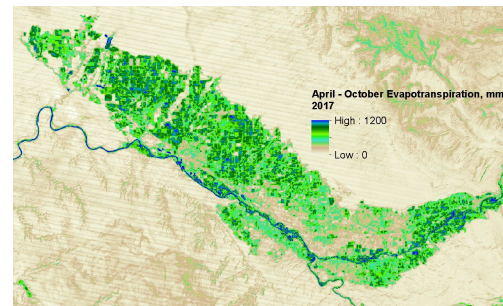


Advancing Agricultural ET estimation

- Reclamation and the Upper Colorado River Commission's recent study recommend eeMETRIC
 - initiated in 2012
 - Intercompared basin wide remote sensing for irrigated agriculture actual evapotranspiration (ET)
 - METRIC and SSEBop
 - Along with methods to estimate potential ET
 - ET Demands
 - Modified Blaney Criddle with an elevation adjustment
- Found eeMETRIC most reliable for topography of the Upper Colorado Basin

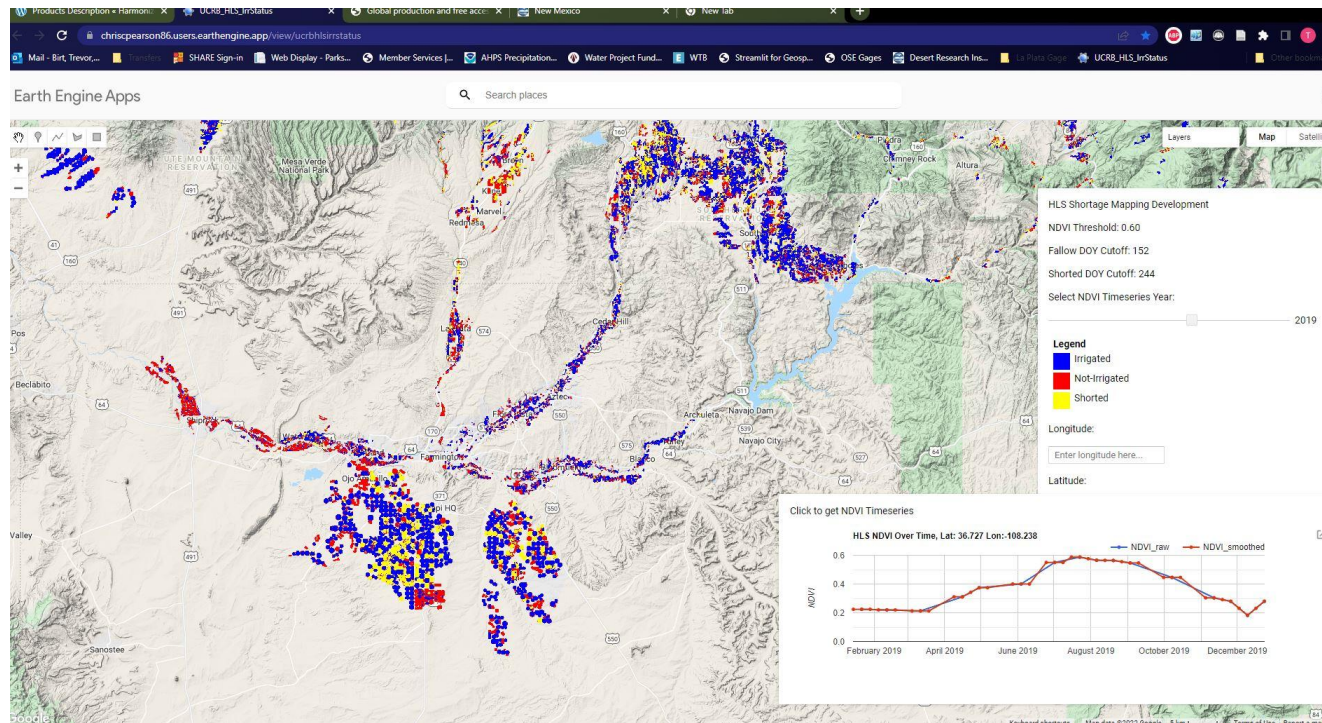


58 Weather stations
4 EC towers



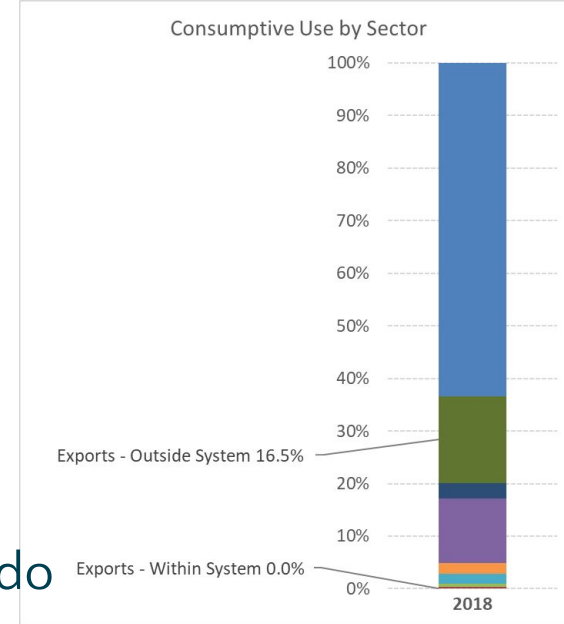
Revisiting Irrigated Acreage Identification

- Reclamation historically relied on GIS, State Ag Statistics, and Census of Agriculture data
- Working with DRI to develop an NDVI based approach for irrigation status mapping



Exports (17%)

- 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



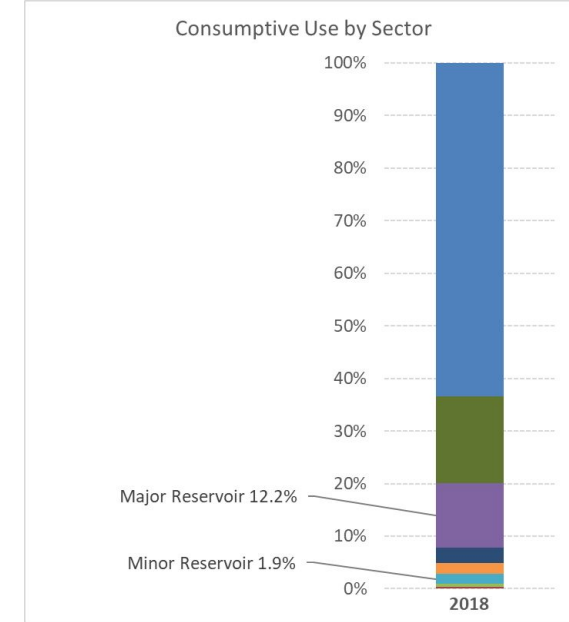
Reservoir Evaporation (14%)

- Major reservoirs (41 reservoirs) (12.2%)
 - Monthly content records available.
 - Average monthly water surface area was determined

Major Reservoir Evaporation= Surface Area * Evaporation Rate

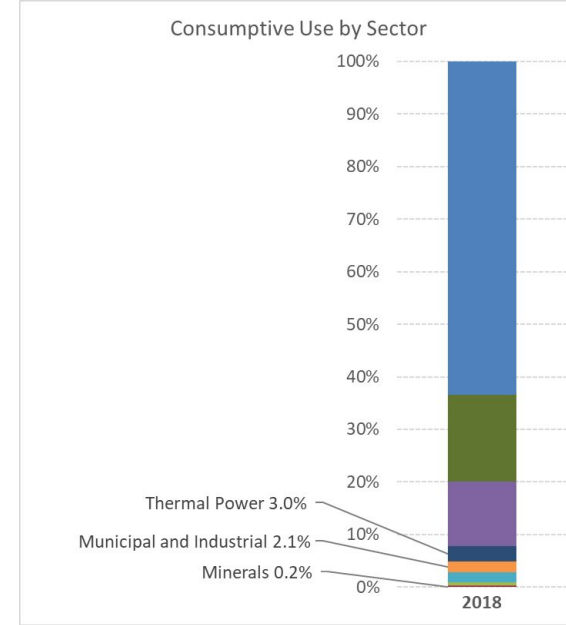
- Minor reservoirs (1000+ reservoirs) (1.9%)
 - For reservoirs lacking records, a “fullness factor” was estimated on the basis of reservoir use and historical hydrologic conditions.
 - These factors were applied to the surface area at total capacity.
 - “fullness factor” taken from the Comprehensive Framework

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



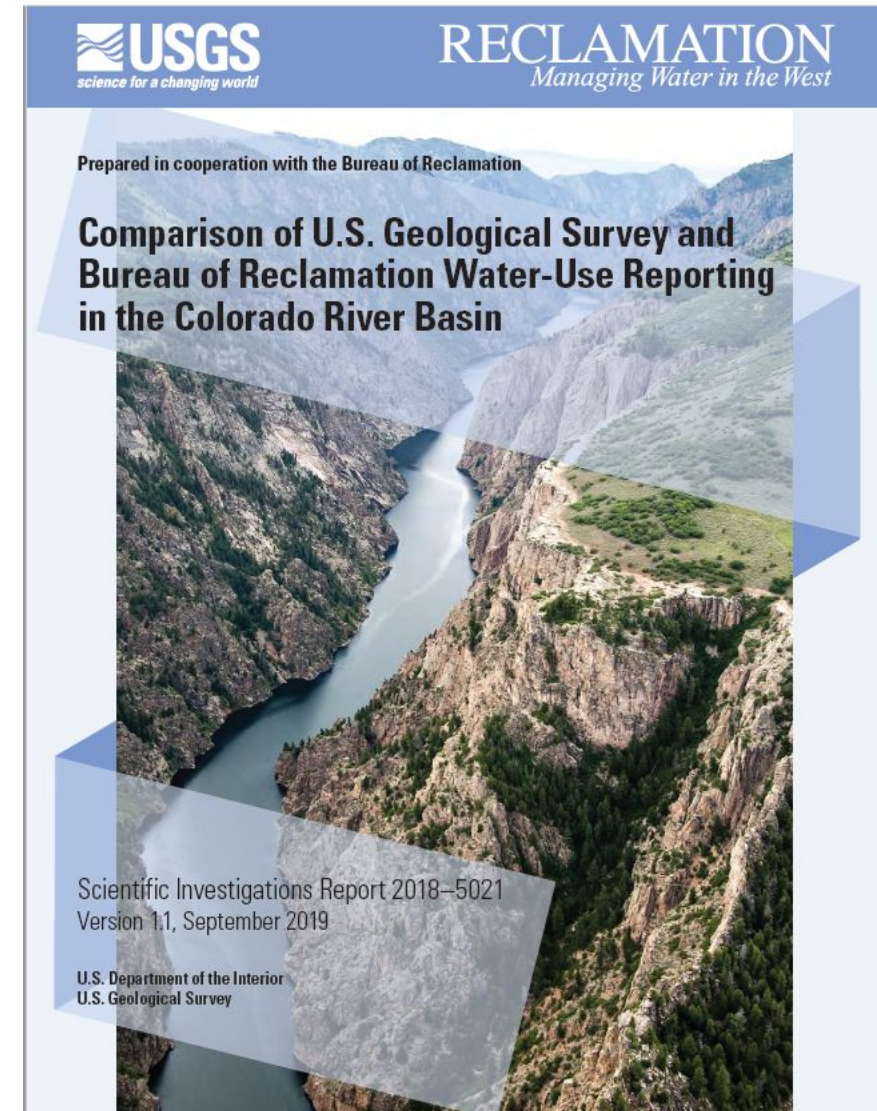
Municipal And Industrial (5%)

- Divided into 3 categories:
 - Thermal Electric Power (3.0%)
 - Other (urban, rural and industrial) (2.1%)
 - Mineral (0.2%)
- Thermal electric power water consumptive use, as available collected directly from powerplant operators.
- Other and Mineral consumptive use data collected by the USGS and last summarized at HUC8 in the 1995 Estimated Use of Water in The United States.
 - Reclamation is exploring updated data released in the recent USGS Colorado River Basin focus study
 - Waiting as USGS works to increase the frequency and spatial scale of their reported data



Regional vs National reporting

- Reclamation and USGS water use reporting comparison
 - Different legal drivers for water use reporting
 - Reports serve different water user communities
 - Compared water use estimation methods
 - Clarified confusing terminology
 - Included a water use glossary
 - Identified opportunities for closer coordination and sharing of information
 - Effort found each agency must clearly define the meaning of the terms used and the appropriate application of the reported information to avoid confusion or the accidental misuse of the information



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
- Currently building a relational database
 - Working with Precision Water Resource Engineering
 - Seeking simpler data sharing and visualization
 - Storing and cataloging source data for each category
 - At source data's native spatial and temporal scale
 - Utilizing our database's computational processor
 - Compute final CU within database when possible
- Developing QA/QC and data visualization
 - Link to new database through PowerBI workbooks, reports, and visualizations



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Stockpond Consumptive Use

- Stockpond consumptive use is assumed to be the evaporation from stockponds.
- Total surface area of the stockponds in the Colorado River Basin from Table 2, page 9 of the “Livestock Water Use, 1975, published by the US Department of Agriculture, Soil Conservation Service.
- The net evaporation was calculated as described for minor reservoir evaporation



Livestock Consumptive Use

- Livestock consumptive use is the daily amount of water consumed by an animal. Incidental water uses or wastes were not taken into account.
- Livestock data are reported on a county basis as part of the state agricultural statistics.
- Livestock consumptive use was estimated by multiplying the number of animals by the average use rate in gallons/head/day.
- Use rates applied as follows:
 - Cattle: 10 gal/head/day
 - Sheep: 2 gal/head/day
 - Hogs: 3 gal/head/day
 - Horses: 10 gal/head/day

