



# **SAN JUAN WATER SUPPLY AND DEMAND ANALYSIS**

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August 9,  
2022

# Project Goals

## Project Goals:

1. Document current and **potential** future water demands for municipal, agricultural, environmental, and recreational users in the Upper San Juan region.
2. Identify options for meeting future potential water supply shortages

## Why is this important:

- The town of Pagosa Springs and surrounding areas continue to grow and, according to water providers, growth has been higher than anticipated in the last few years.
- The San Juan region has been severely impacted by the “millennial drought”
- While not the primary goal of this study, much of the information in this study could be used to guide upcoming diligence on the San Juan River Headwaters Project (Dry Gulch Reservoir) water rights

# Project Goals

## Approach:

- Improve information that informed the decision to abandon the District's West Fork water rights through:
  - Further discussions with the city, county, and subdivision water providers
  - Incorporation of environmental and recreational flow needs identified in the San Juan Watershed Enhancement Partnership (WEP) Phase II Report on Non-Consumptive Needs Assessment
  - A cursory look at potential increases in demand and decreases in supply based on the climate-projected scenarios used to inform the Colorado Water Plan update
- Provide DRAFT Technical Memorandum for Board Review
- Present for Board, Public, and WEP participant feedback

# Municipal & Industrial Demand

- To identify current and **potential** future municipal demand, WWG reached out to:
  - Town of Pagosa Springs
  - Pagosa Area Water and Sanitation District (PAWSD)
  - Archuleta County
  - San Juan River Village Metro District and Aspen Springs Metro District
- Highlights from those conversations:
  - New housing development plan submittals and interest in new housing developments have increased over recent past levels
  - COVID shutdown resulted in an increase in water use from second homeowners
  - Number of taps and applications for building permits have increased
  - A new HGTV show, Root Design, could put a national spotlight on Pagosa Springs
  - Continued early runoff and the possibility of a large wildfire impacting diversion infrastructure are two of the biggest concerns

# Municipal & Industrial Demand

- Chose a range of population projections (Low, Medium, and High) to estimated 2050 demands based on:
  - Colorado Demographers Office
  - 2019 Growing Water Smart Group Projections
  - PAWSD – 2020 Drought Management Plan (2% growth through 2030)
  - Technical Update to the Colorado Water Plan
- Based on these sources and consensus from Pagosa Springs, PAWSD, and Archuleta County, the following three projections were used:
  - Low: 1.7% Growth through 2050
  - Medium: 2.6% Growth through 2050
  - High: 5% Growth for ten years, then 2% Growth through 2050

# Municipal & Industrial Demand

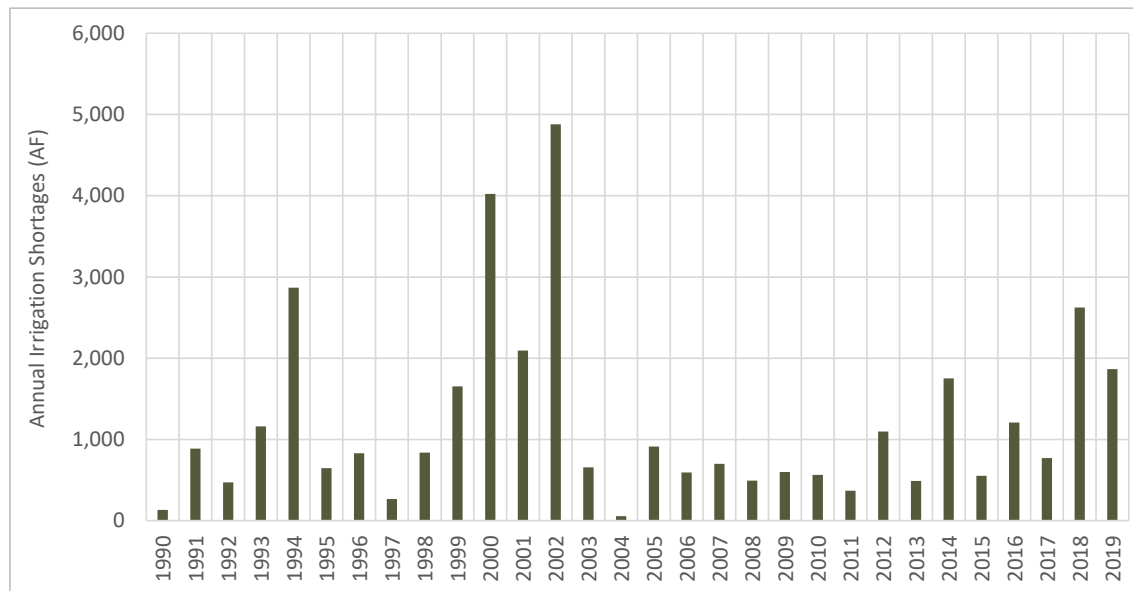
- The three population ranges result in a range of municipal demands
- GPCD generally includes household use, commercial use, outdoor irrigation (parks), and inefficiency in deliveries (leaks)
- PAWSD 2008 Water Conservation Plan estimated gpcd as 315

	Current (2020)	2050 Projections		
		Low (1.7%)	Medium (2.6%)	High (5% for ten years, 2% after)
<b>Population</b>	10,025	16,623	21,652	24,979
<b>GPCD</b>	226	226	226	226
<b>Demand</b>	2,536 AF	4,208 AF	5,481 AF	6,323 AF

*Note that GPCD was held constant for this analysis. PAWSD may continue implementing water conservation practices that could impact GPCD, however it is hard to predict what conservation practices could be implemented, or the impact of those practices. WWG felt it was best to be conservative with the GPCD estimates.*

# Agricultural Water Supply and Shortages

- State of Colorado irrigation assessments show irrigated acreage in the San Juan basin has decreased by 13% since 1990
- The Technical Update projected no increase in irrigated acreage through 2050
- Historical irrigation shortages are not expected to increase even if recent dryer hydrology continues



# Environmental and Recreational Demands

- As with the West Fork Water Rights Study, WWG considered how often both the instream flow through the town of Pagosa Springs and the environmental bypass stipulations associated with the Dry Gulch Reservoir water rights are not met
- WWG also relied on the recent WEP Phase II Non-consumptive Report to provide more incite into **potential** environmental and recreational demands
  - Recreational Flows
    - Wade Fishing
    - Float Fishing
    - Tubing
    - Rafting
  - Environmental Flows
    - Sediment Transport flows



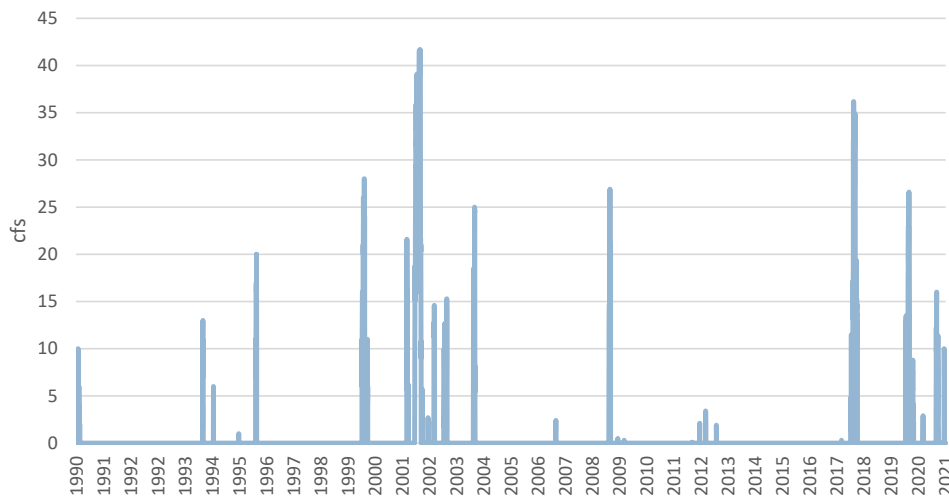
# Environmental and Recreational Demands

- The Phase II report acknowledged that recreational demands from surveys are based on opinions and are dependent on skill level, river knowledge, and other factors
- The Phase II Report indicated “this document should be used only as foundational information in support of planning-level discussions that identify high-priority projects, processes and management actions that help support a diversity of water uses. Subsequent planning phases are expected to include more detailed, site-specific evaluations”

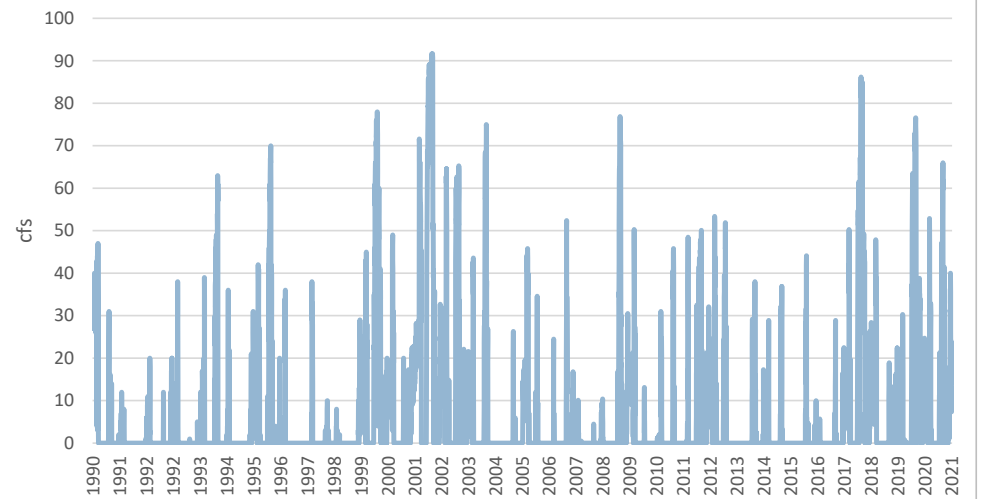
# Environmental Shortages

- The instream flow water right is 50 cfs from March 1 to August 31 and 30 cfs from September 1 to February 29
- Stipulated flows are double the current instream flow right on the mainstem of the San Juan River (100 cfs from March 1 to August 31 and 60 cfs from September 1 to February 29)

Daily San Juan River Instream Flow Shortages

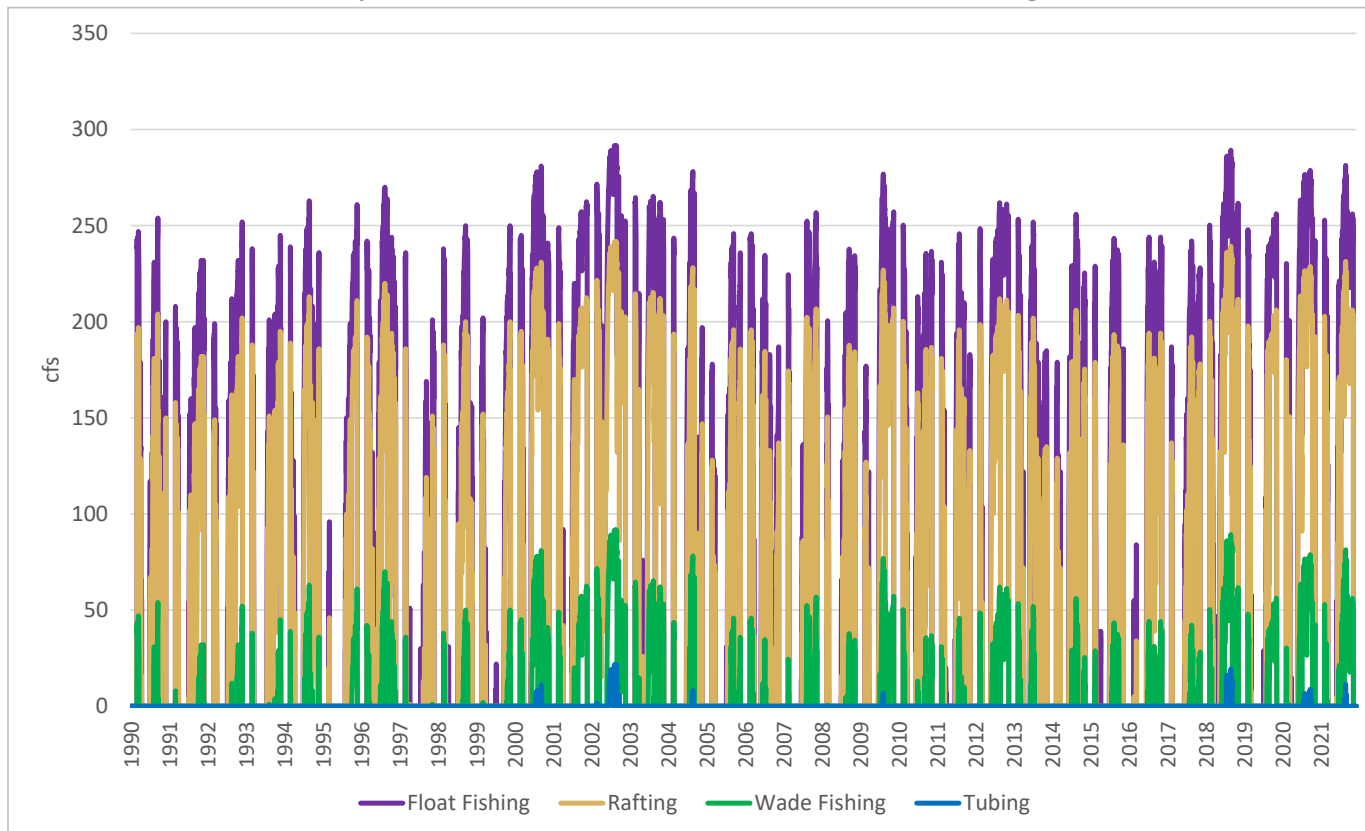


Daily San Juan River Environmental Stipulated Flow Shortages



# Recreational Shortages

Daily San Juan River Recreational Flow Shortages

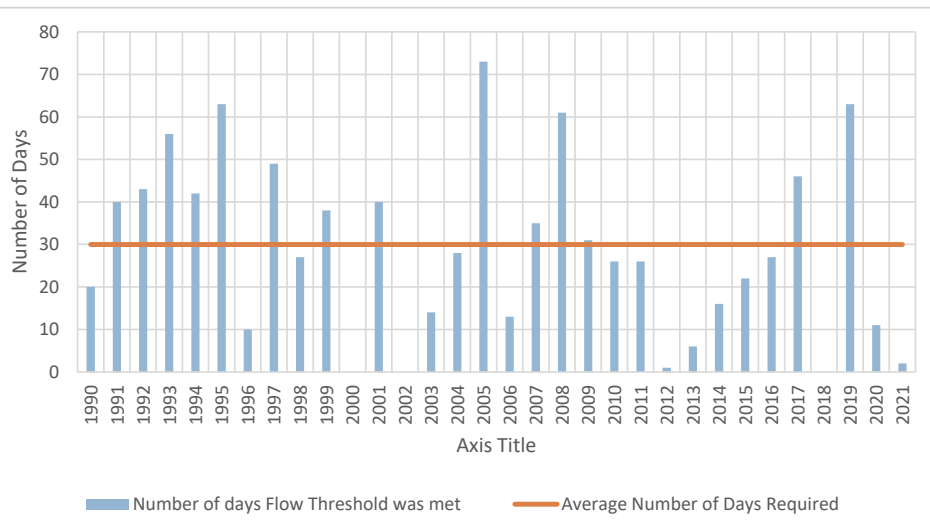


- Recreational flows are based on the Lower Acceptable target flows
- Float Fishing has the highest demand and shortages
- Tubing has the lowest demand and shortages

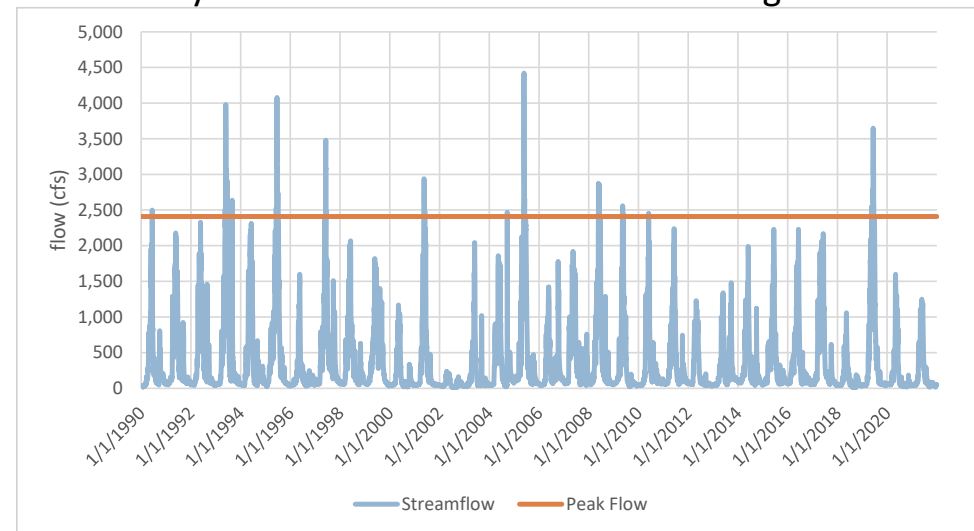
# Sediment Transport

- Phase II Report Transport Threshold: 1,225 cfs for roughly 30 days per year
- Peak Flow – Effective Discharge: 2,410 cfs for 3 days roughly every two years

## Number of days Transport Threshold was Met



## Daily Streamflow and the Peak Flow Target Flow



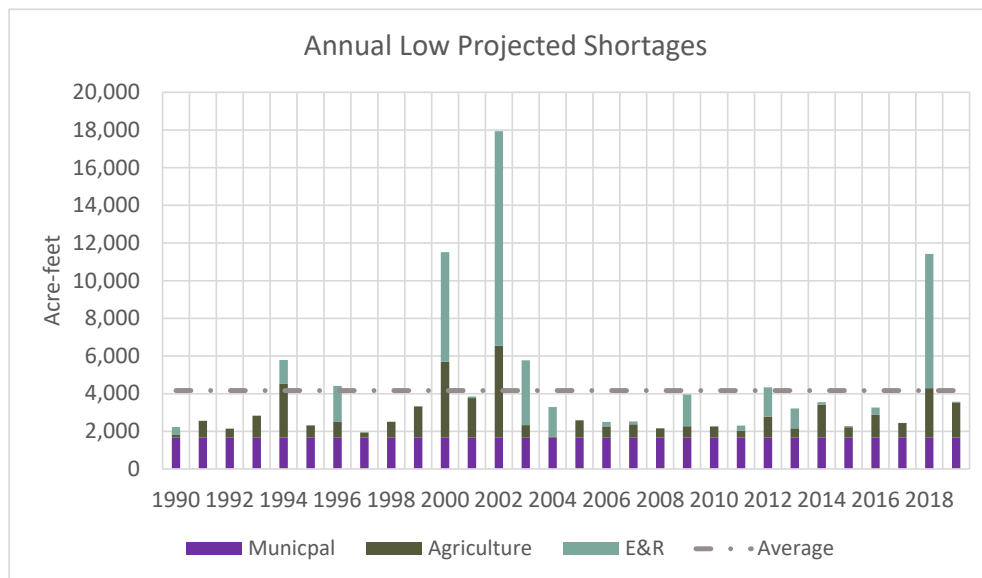
# Environmental and Recreational Scenarios

- WWG created three scenarios to investigate environmental and recreational flow needs
  - Minimum – Meet the mainstem instream flow, which also ensures the lower acceptable range for tubing is met
  - Mid-Range – Meet the stipulated environmental flows and the lower acceptable range for wade fishing March to November
  - Maximum – Meet the maximum recreational demand for all categories each month

	Minimum	Mid-Range	Maximum
Average Annual Shortages	1,288	6,298	68,571

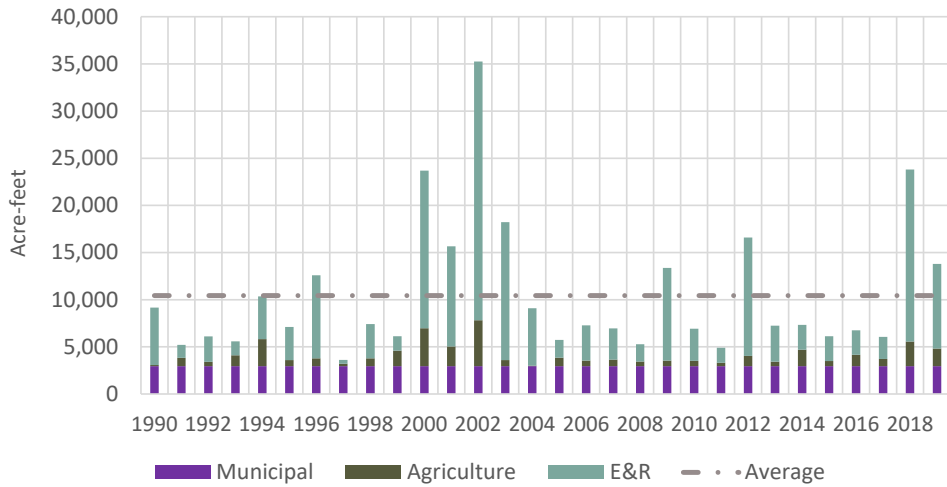
# Total Projected Shortages

- The estimated demand categories were combined for a projected range of 2050 demands as follows:
  - Low Demand – Low municipal growth, minimum environmental and recreational demands, and historical agricultural shortages
  - Mid-range Demand – Medium municipal growth, mid-range environmental and recreational demands, and historical agricultural shortages
  - High Demand – High municipal growth, high environmental and recreational demands, and historical agricultural shortages

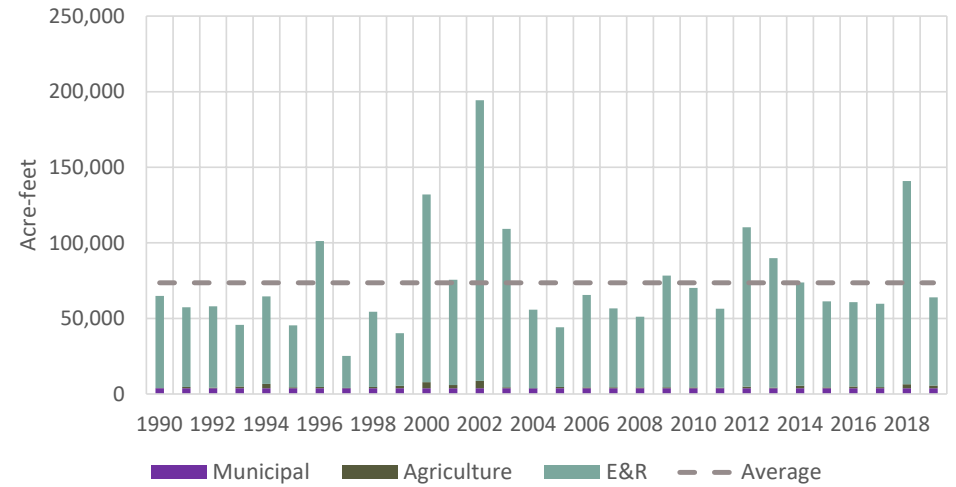


# Total Projected Shortages

## Annual Mid-Range Projected Shortages



## Annual High Projected Shortages



# Potential Reservoir Sizes

- Sizing a reservoir depends on potential demands the District would like to meet
- The limiting factors in reservoir sizing are:
  - Legally and physically available water to fill the reservoir
  - Filling constraints (Dry Gulch 50 cfs water right)
  - Demands driving reservoir releases
- A daily water availability analysis was used to determine a range of reservoir sizes to meet the potential range of shortages
- Illustrative goal was to meet municipal demands all years and to meet other shortages in wet and average years



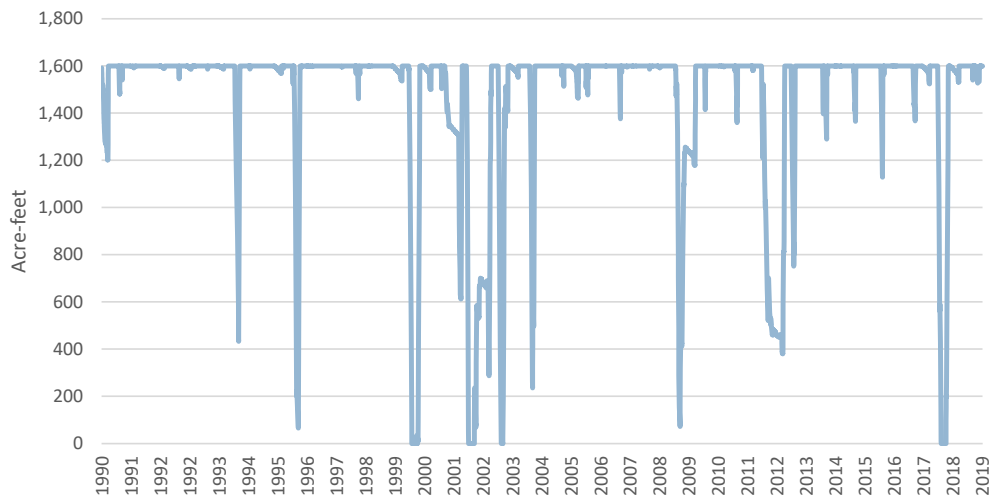
# Potential Reservoir Sizes

- Reservoir sizes could only be determined for Low and Mid-Range demand shortages
- The annual high demand shortages are greater than water available for filling the reservoir; a reservoir cannot meet the high demand shortages regardless of size

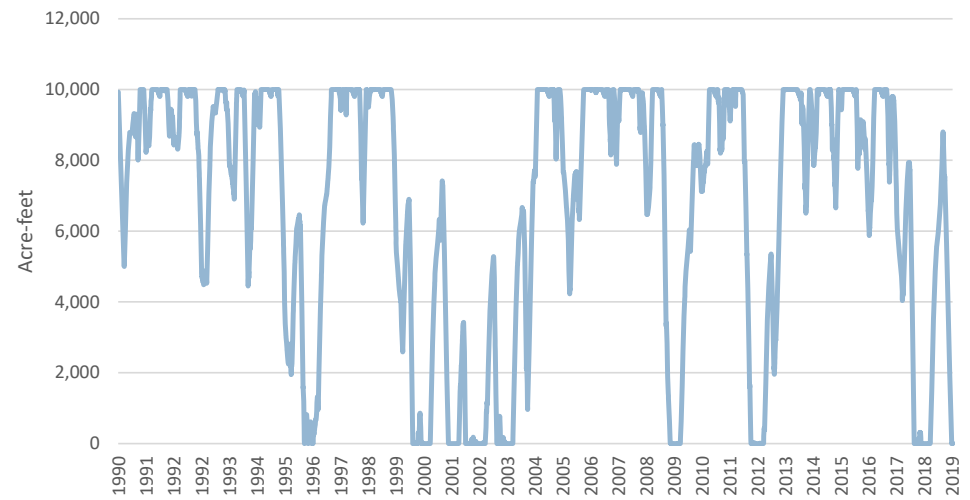
	Low	Mid-Range
Potential Reservoir Size	1,600 AF	10,000 AF

# Potential Reservoir Sizes

Daily Reservoir Contents – Low 1,600 AF



Daily Reservoir Contents – Mid-Range 10,000 AF



# Alternative Measures to Meet Projected Demands

- Research into methods and benefits of improving natural water storage is on-going. Improved natural water storage likely improves baseflows later in the summer
  - Stream Restoration, natural or simulated Beaver Ponds, and Forest Health have been cited as potential avenues for increasing natural water storage
- Another potential option to meet demands is temporary voluntary agricultural fallowing. Temporary fallowing could benefit streamflow and meet other demands during drought years
  - Several research projects have been conducted or are underway to investigate the effects temporary fallowing of perennial grass fields have on both streamflow and hay yield in the year of fallowing and subsequent years
  - Note that fallowing 25% of the irrigated acreage above Pagosa Springs would yield about 1,300 acre-feet of consumptive use savings

# Summary

- Municipal demands are difficult to project. Population will likely increase at some level and conservation efforts will also likely increase. Currently, PAWSD has secured a supply that can, at a minimum, meet short-term projections through a 2-year drought.
- Meeting all the environmental and recreational target flows in the WEP Phase II report, even with new storage, is not feasible as a junior reservoir will need to fill during runoff - which could impact some of the target flows.
- The range of target flows reported in the WEP Phase II report could allow the District to work with the town of Pagosa Springs to identify environmental and recreational flow targets that would benefit both tourism and the environment.
- Sizing of any potential reservoir is dependent on the demands identified as critical by the District.
- The demand/shortage estimates and potential reservoir sizing analysis done for this study is not intended to be prescriptive - but should help inform the District's options for Dry Gulch water rights diligence efforts.