



Trends In Temperature, Precipitation And Stream Runoff In The San Juan Mountains: 2000 – 2021

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Dedicated To
The Memory Of



John Porter
1933 - 2020



Can It Really Be This Dry?

Mountain View Crest – 13,000'
June 18, 2021



“Just The Facts”

- Fact-based analysis to improve our understanding of the impact that continuing drought has had on rivers flowing from the San Juan Mountains**
- Simple statistical analysis of historical trends in temperature, precipitation and stream runoff**
- Not a sophisticated hydrologic or climate model attempting to explain reasons for trends**
- Does not make projections about future trends**

Key Elements

- **San Juan Mountains provide stream runoff for the San Juan, Dolores, Gunnison and Rio Grande river basins**
- **Temperature, precipitation and stream runoff data for 32 years (1990 thru 2021)**
- **Changes in temperature, precipitation and stream runoff from 2000 thru 2021 are measured against 1990-99 baseline period**
- **Temperature and precipitation data provided by 23 SNOTEL sites (NRCS)**
- **Stream runoff data provided by 18 stream gauges (USGS or Colorado)**

Molas Lake SNOTEL Site March 2, 2022



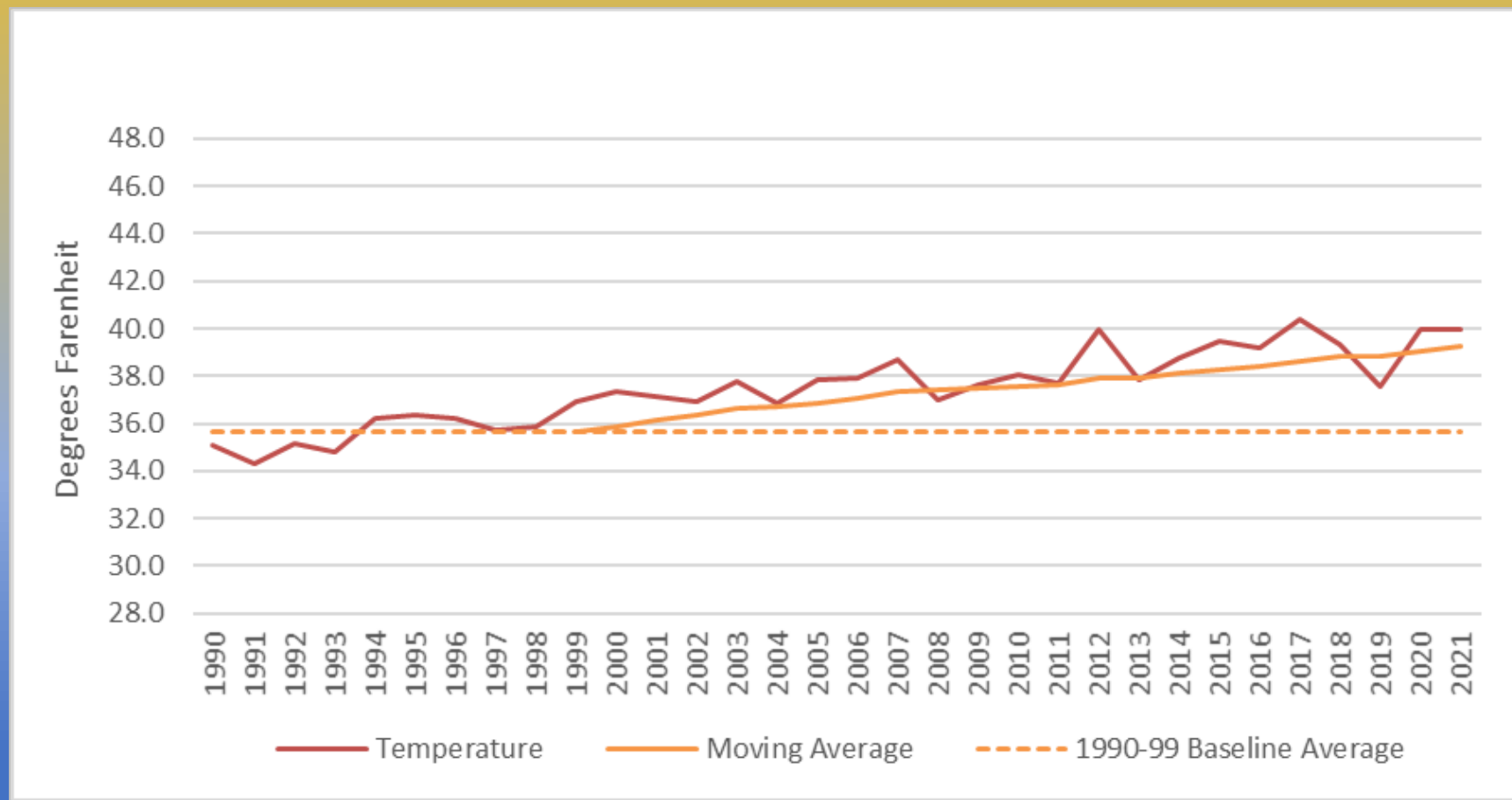
Temperature - Annual

Average Annual

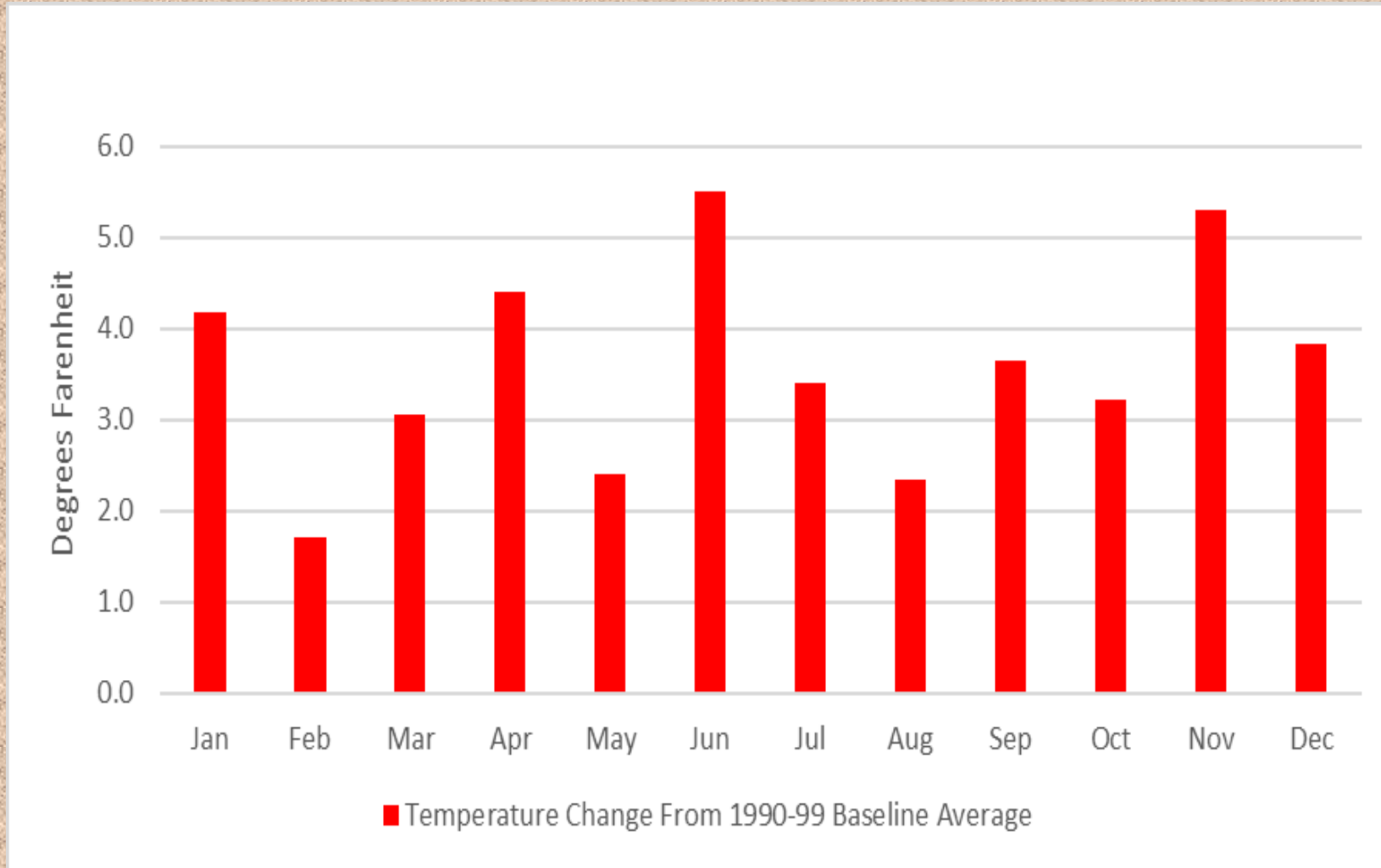
1990-99 = 35.7 °F

2012-21 = 39.2 °F

Overall = +3.6 °F



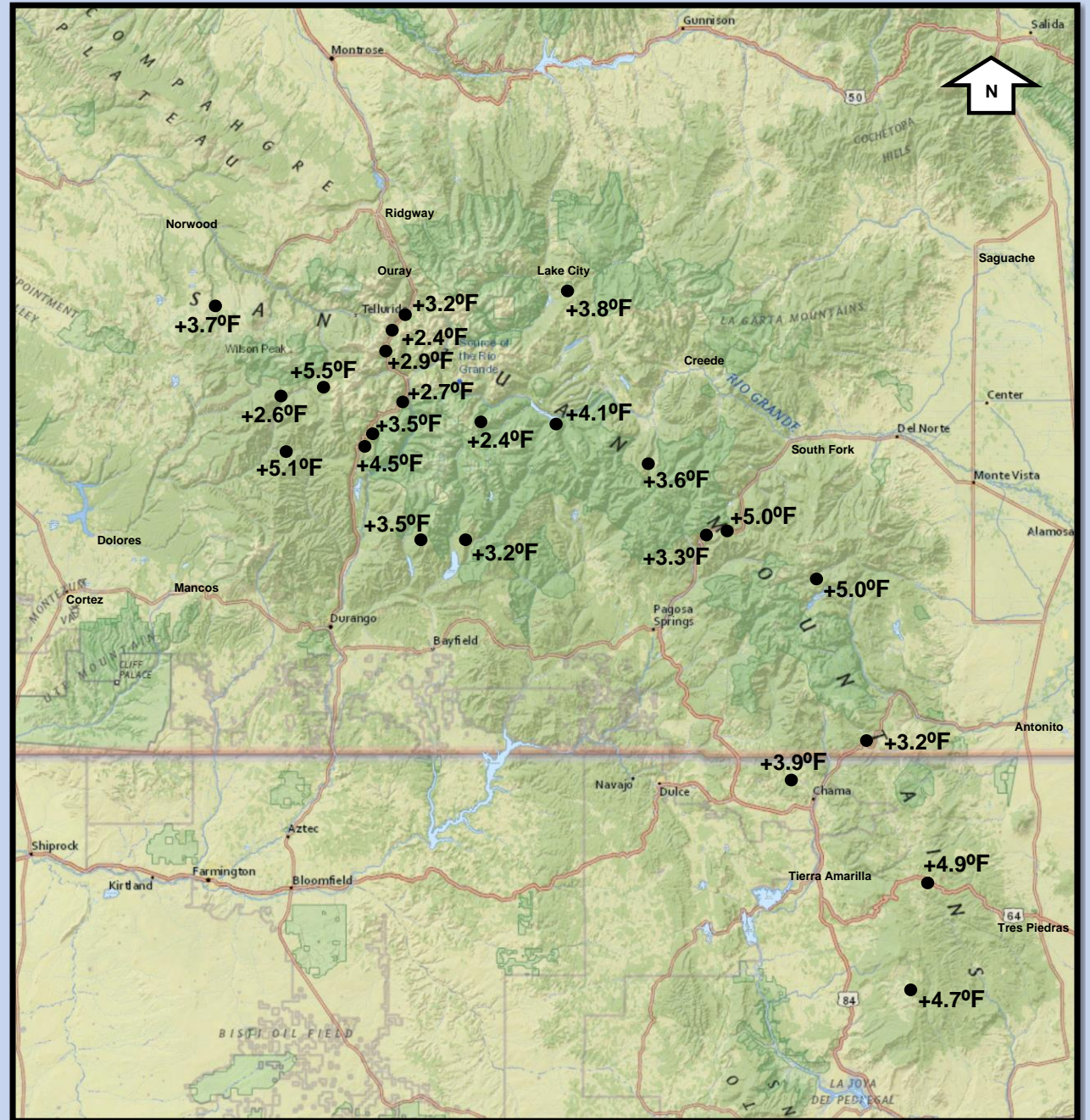
Temperature – Monthly Change



Jan	=	+4.2 °F
Feb	=	+1.7 °F
Mar	=	+3.1 °F
Apr	=	+4.4 °F
May	=	+2.4 °F
Jun	=	+5.5 °F
Jul	=	+3.4 °F
Aug	=	+2.3 °F
Sep	=	+3.7 °F
Oct	=	+3.2 °F
Nov	=	+5.3 °F
Dec	=	+3.8 °F

SNOTEL Temperature Change

- Above average temperature increases more prevalent in South San Juans
- Below average temperature increases more prevalent in North San Juans
- Dolores River headwaters mixture of above & below average temperature increases



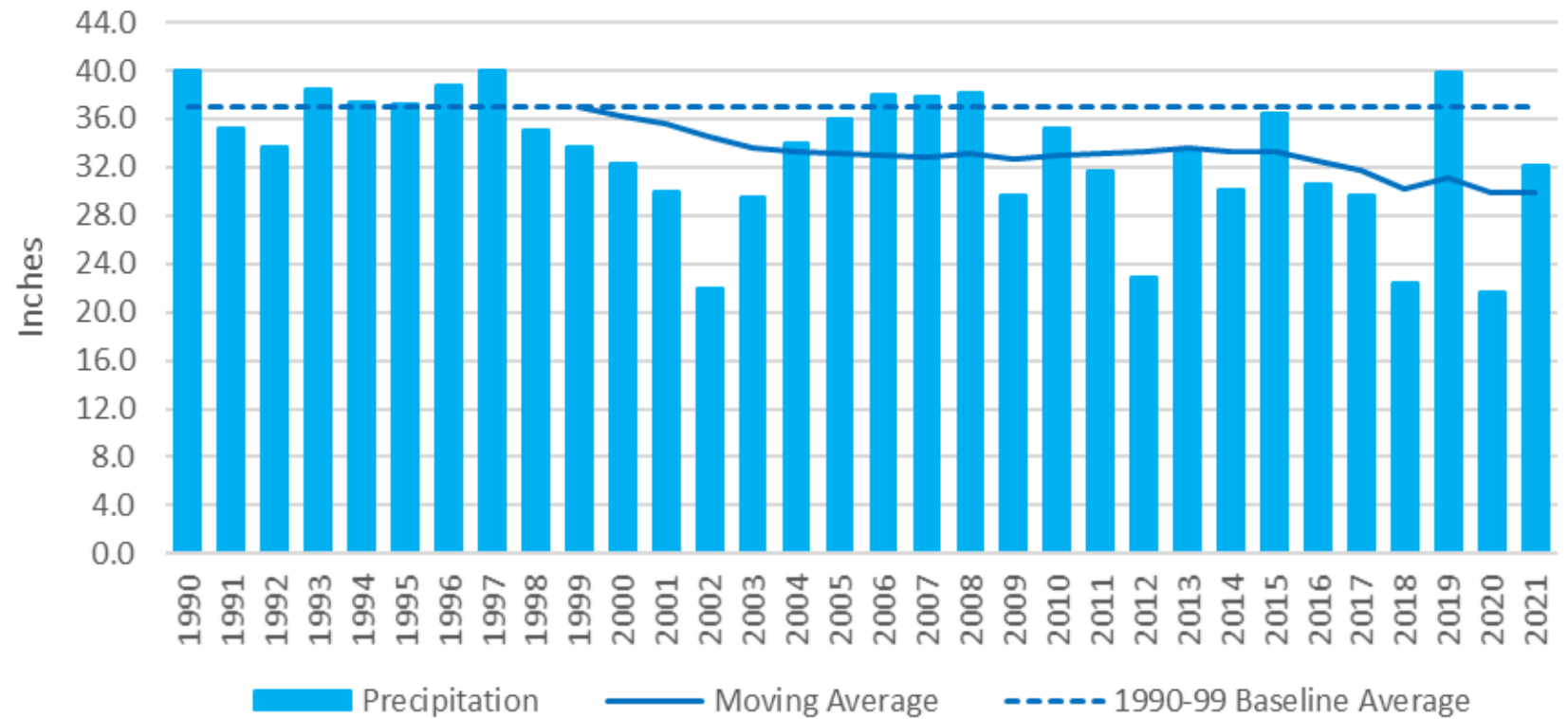
Precipitation - Annual

Total Annual

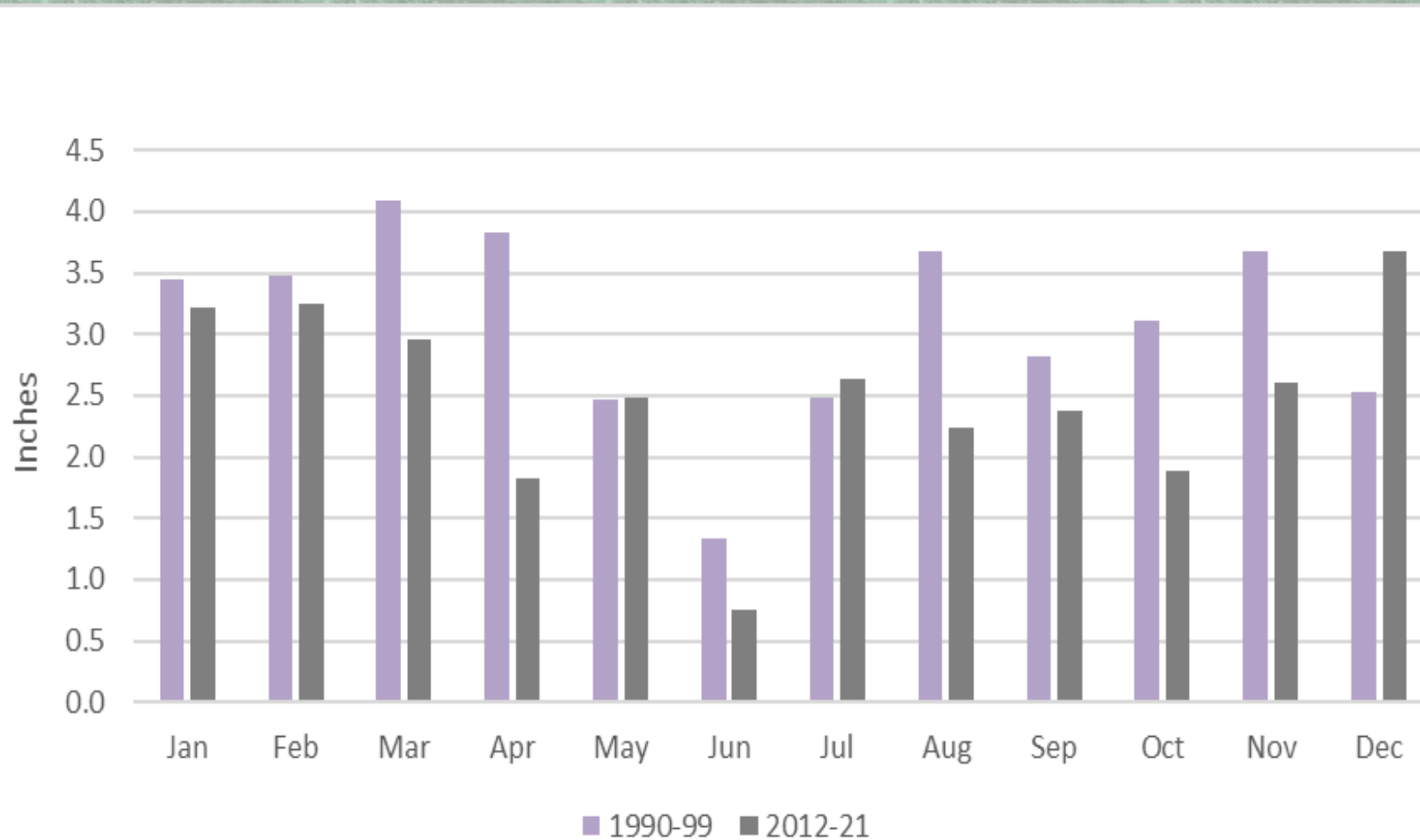
1990-99 = 36.9"

2012-21 = 29.9"

Overall = -7.0" or
-19.0%



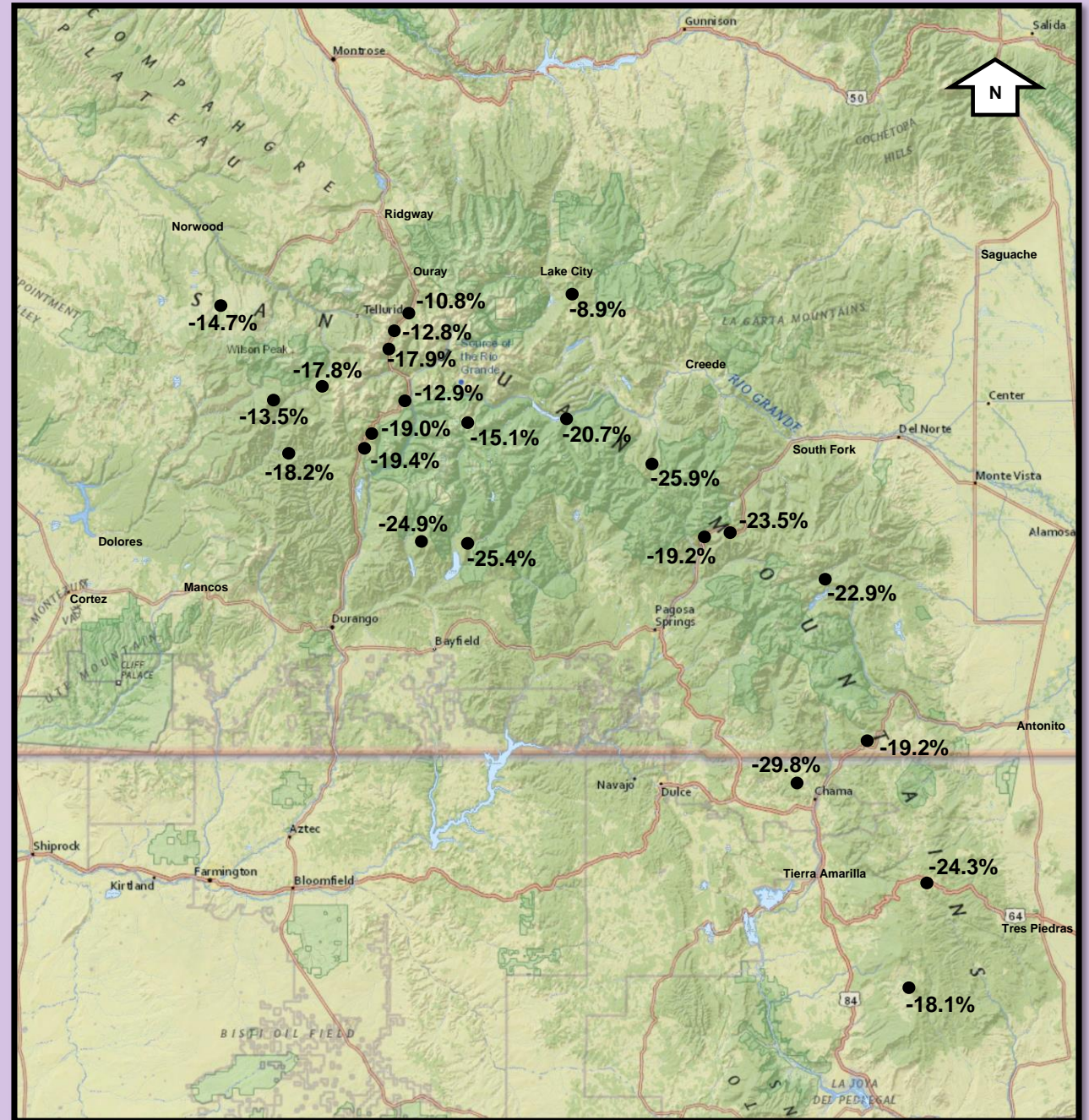
Precipitation – Monthly Change



Jan	=	-0.2"	/	-6.4%
Feb	=	-0.2"	/	-6.5%
Mar	=	-1.1"	/	-27.9%
Apr	=	-2.0"	/	-52.4%
May	=	+0.0"	/	+0.6%
Jun	=	-0.6"	/	-43.4%
Jul	=	+0.2"	/	+6.6%
Aug	=	-1.4"	/	-39.0%
Sep	=	-0.5"	/	-16.0%
Oct	=	-1.2"	/	-39.3%
Nov	=	-1.1"	/	-29.2%
Dec	=	+1.1"	/	+45.4%

SNOTEL Precipitation Change

- Above average precipitation decreases prevalent along southern front extending into South San Juans
- Below average precipitation decreases prevalent in North San Juans



Seasonal Temperature & Precipitation Change*

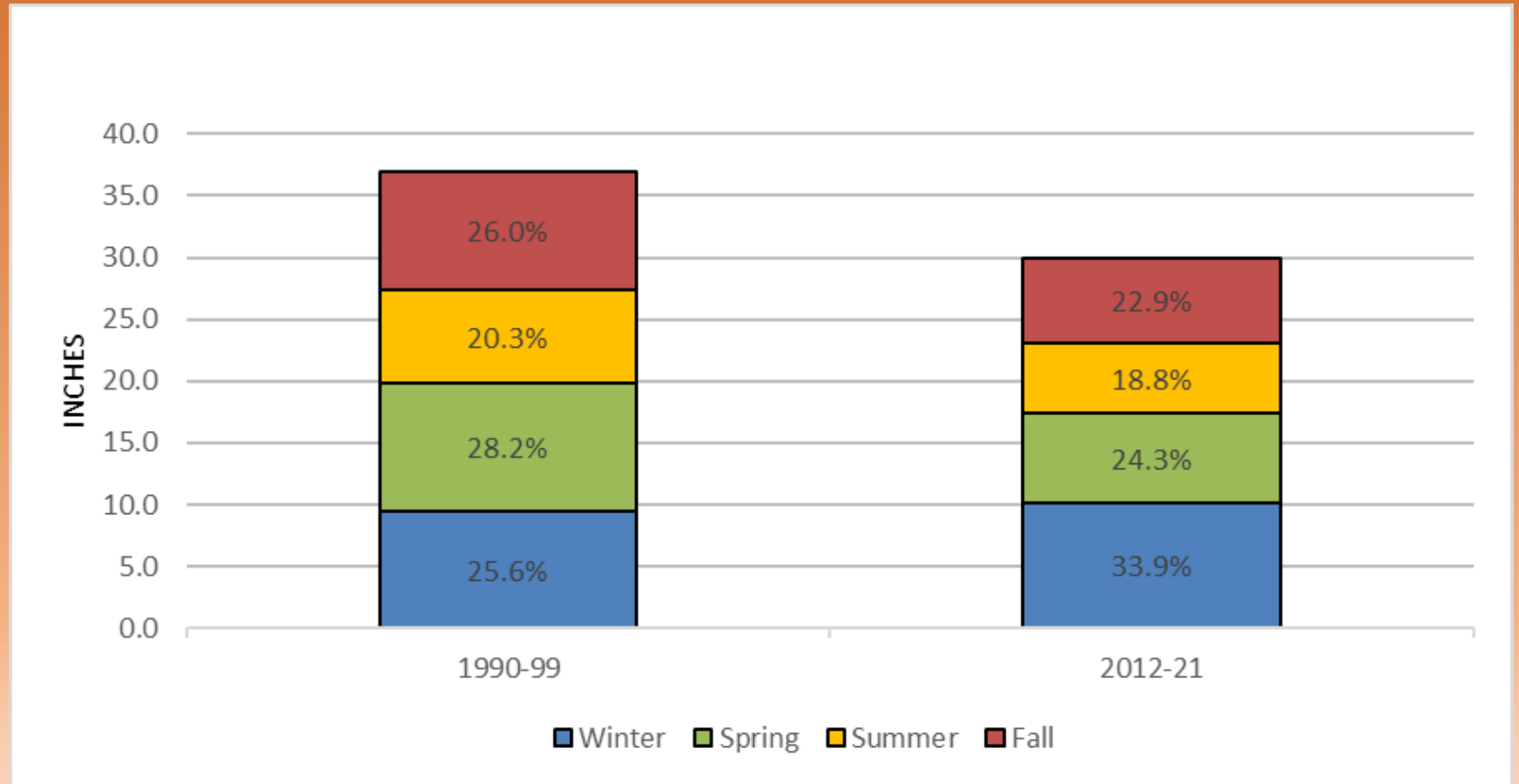
- Below average temperature increases in Winter & Spring
- Above average temperature increases in Summer & Fall
- Increase in precipitation during Winter
- Significant decline in precipitation during Spring, Summer & Fall

<u>Season</u>	<u>Temp Change **</u>	<u>Precip Change ***</u>	<u>Precip % Change</u>
Winter (Dec-Feb)	3.2	0.7	7.5%
Spring (Mar-May)	3.3	-3.1	-30.1%
Summer (Jun-Aug)	3.8	-1.9	-24.7%
Fall (Sep-Nov)	4.1	-2.7	-28.6%
Annual	3.6	-7.0	-19.0%

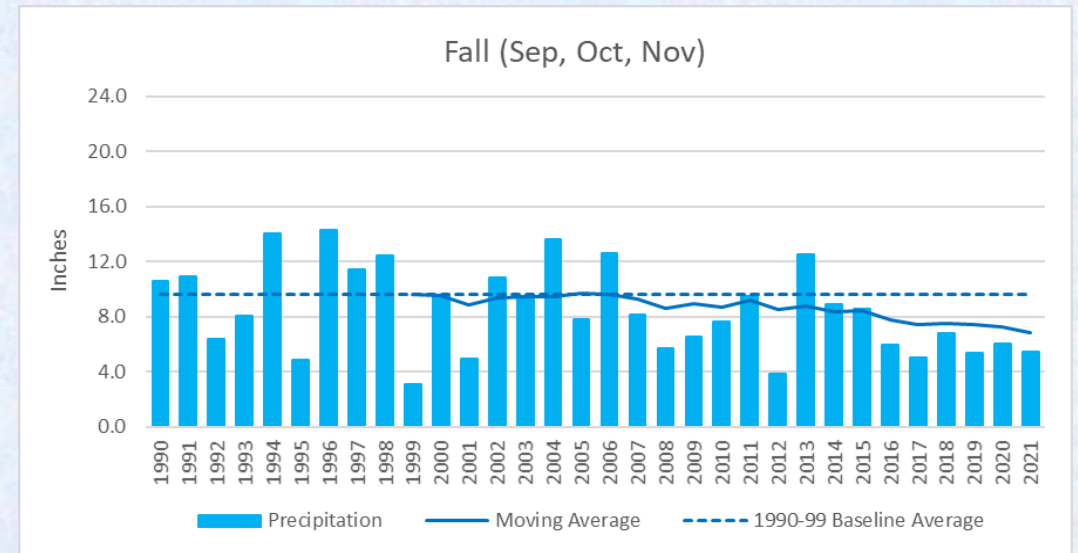
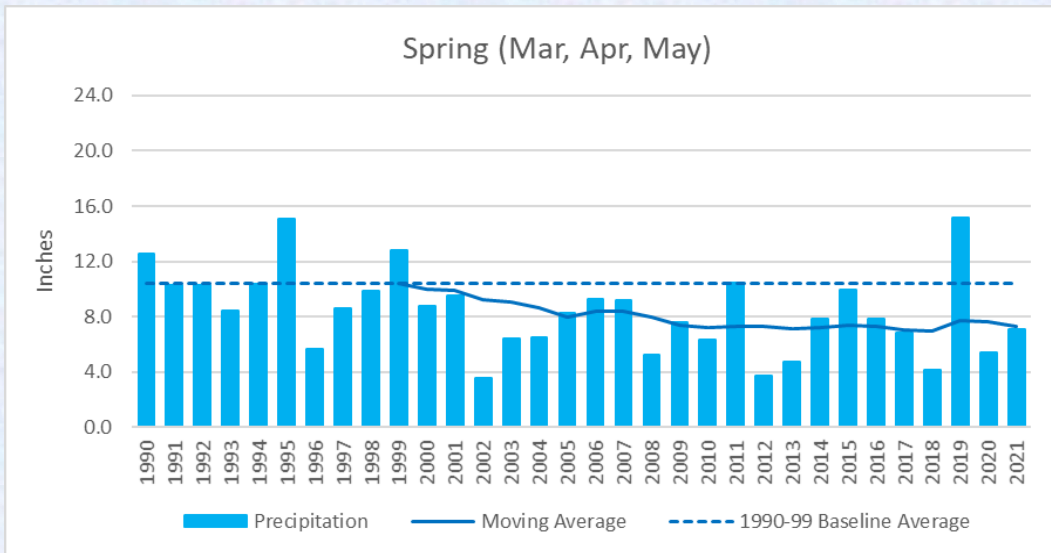
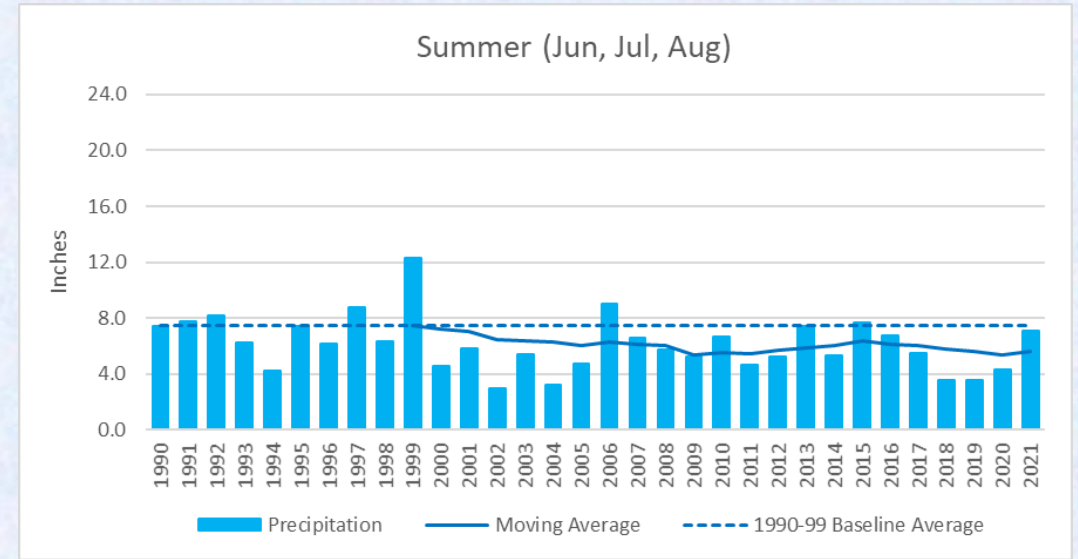
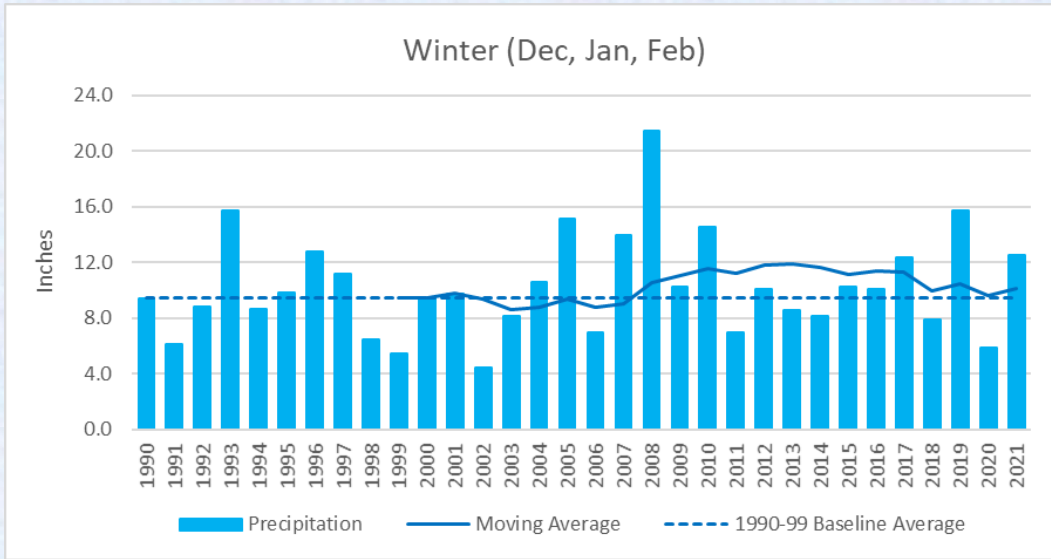
* 2012-21 Average relative to 1990-99 Baseline Average
** Degrees Farenheit
*** Inches

Precipitation – Seasonal Comparison

- Winter precipitation proportionate increase from 25.6% to 33.9%
- Spring, Summer & Fall precipitation proportionate decrease from 74.5% to 66.0%

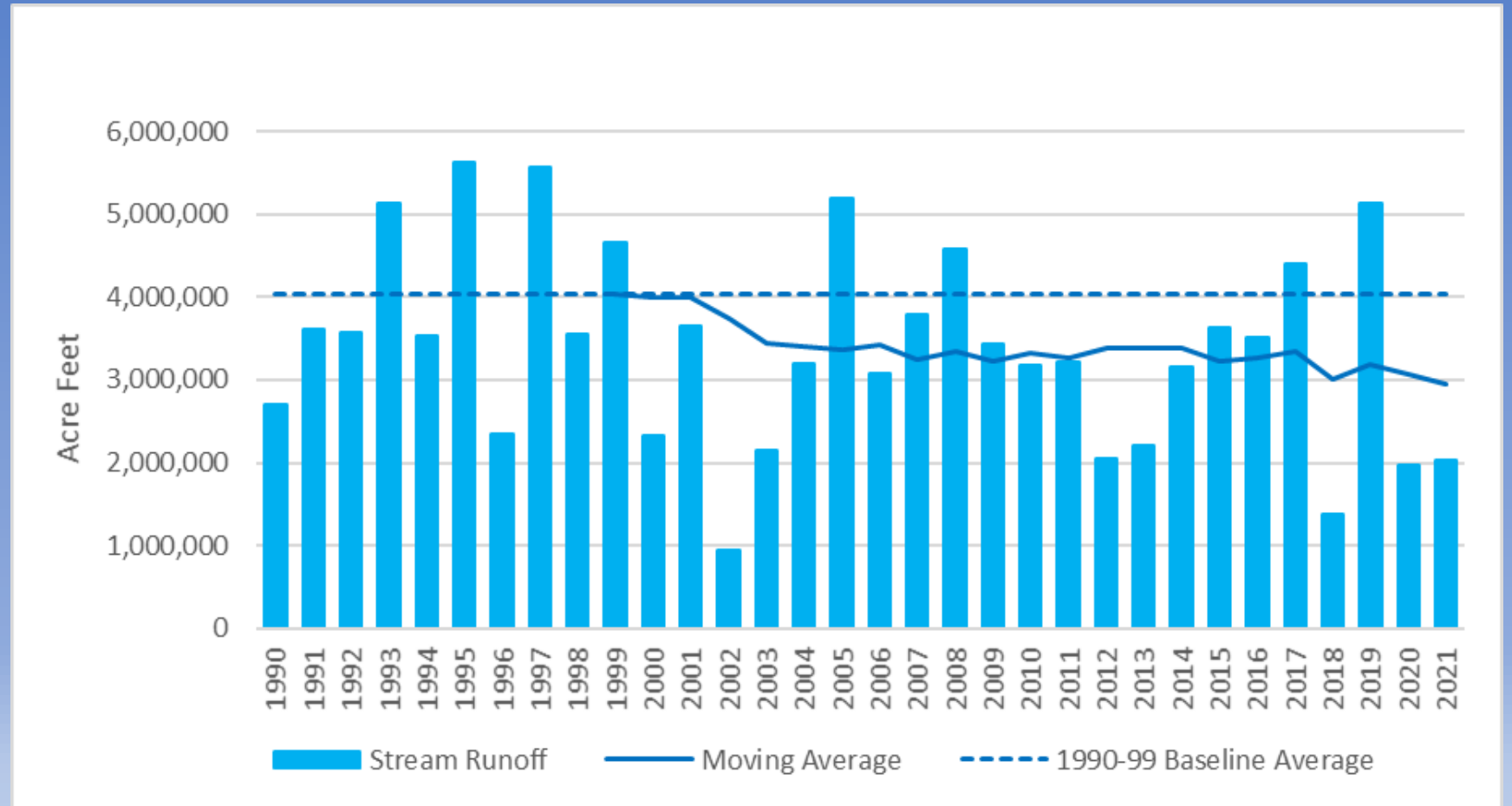


Precipitation – Seasonal Comparison



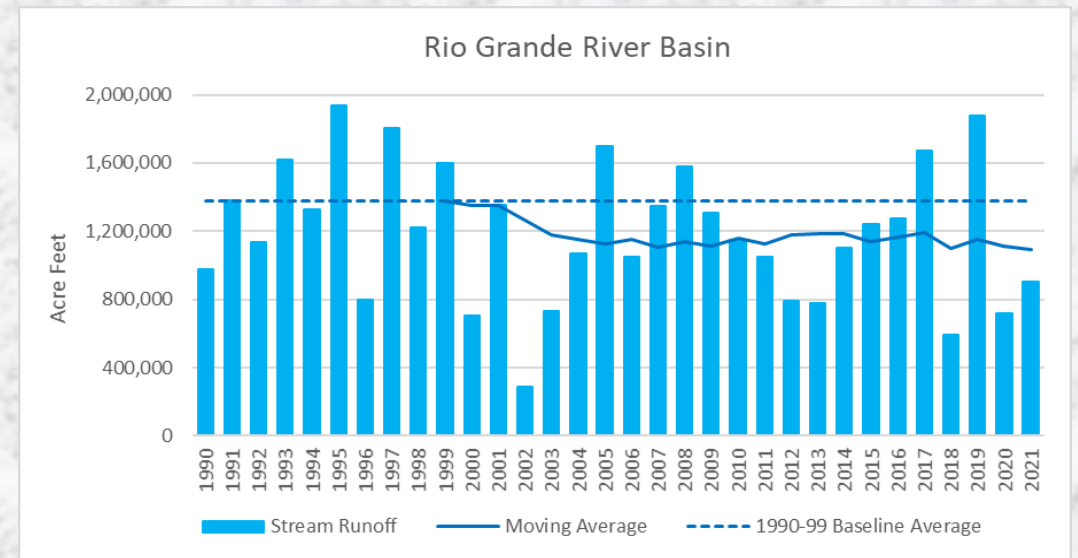
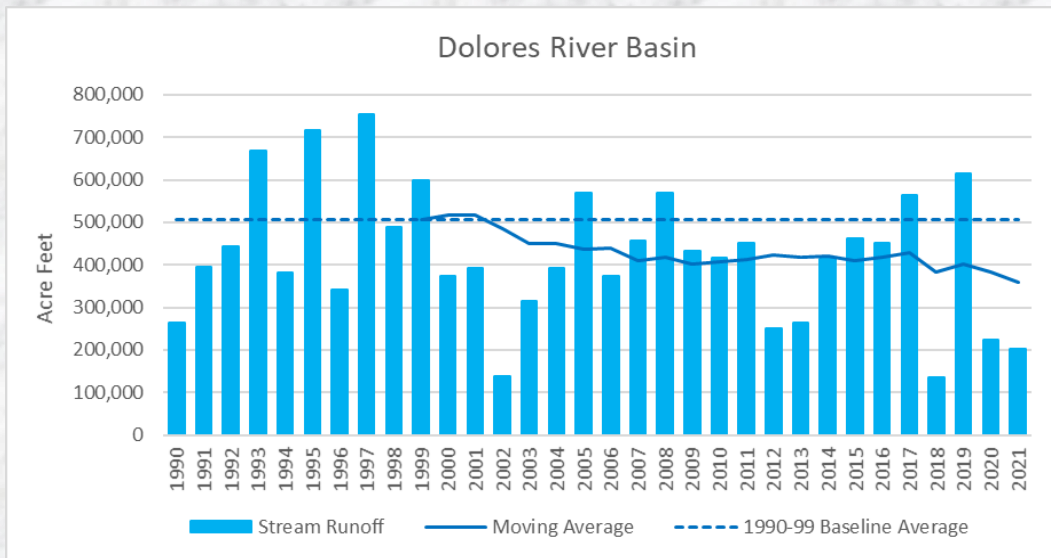
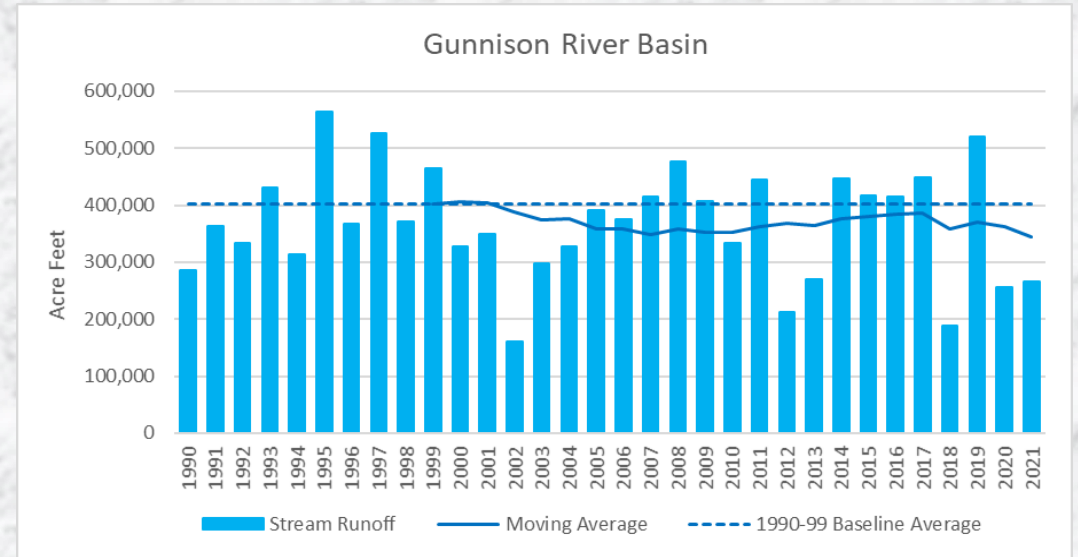
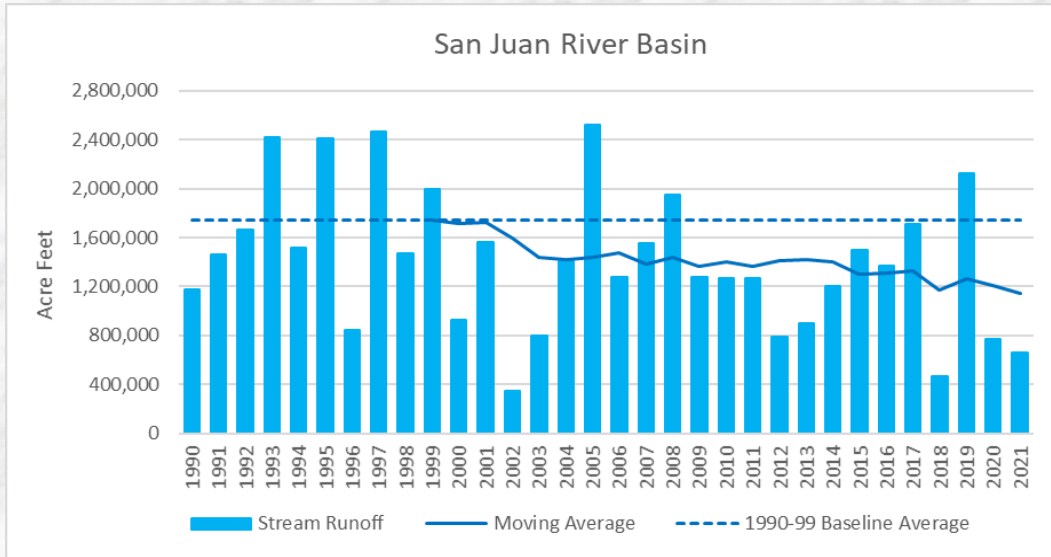
Stream Runoff - Annual

- All 18 stream gauges recorded declines in annual runoff
- Combined annual runoff declined from 4,031,185 to 2,946,123 acre feet
- Combined annual runoff declined **-1,085,063** acre feet or **-26.9%**
- San Juan = **-34.1%**
Dolores = **-29.2%**
Gunnison = **-14.5%**
Rio Grande = **-20.6%**



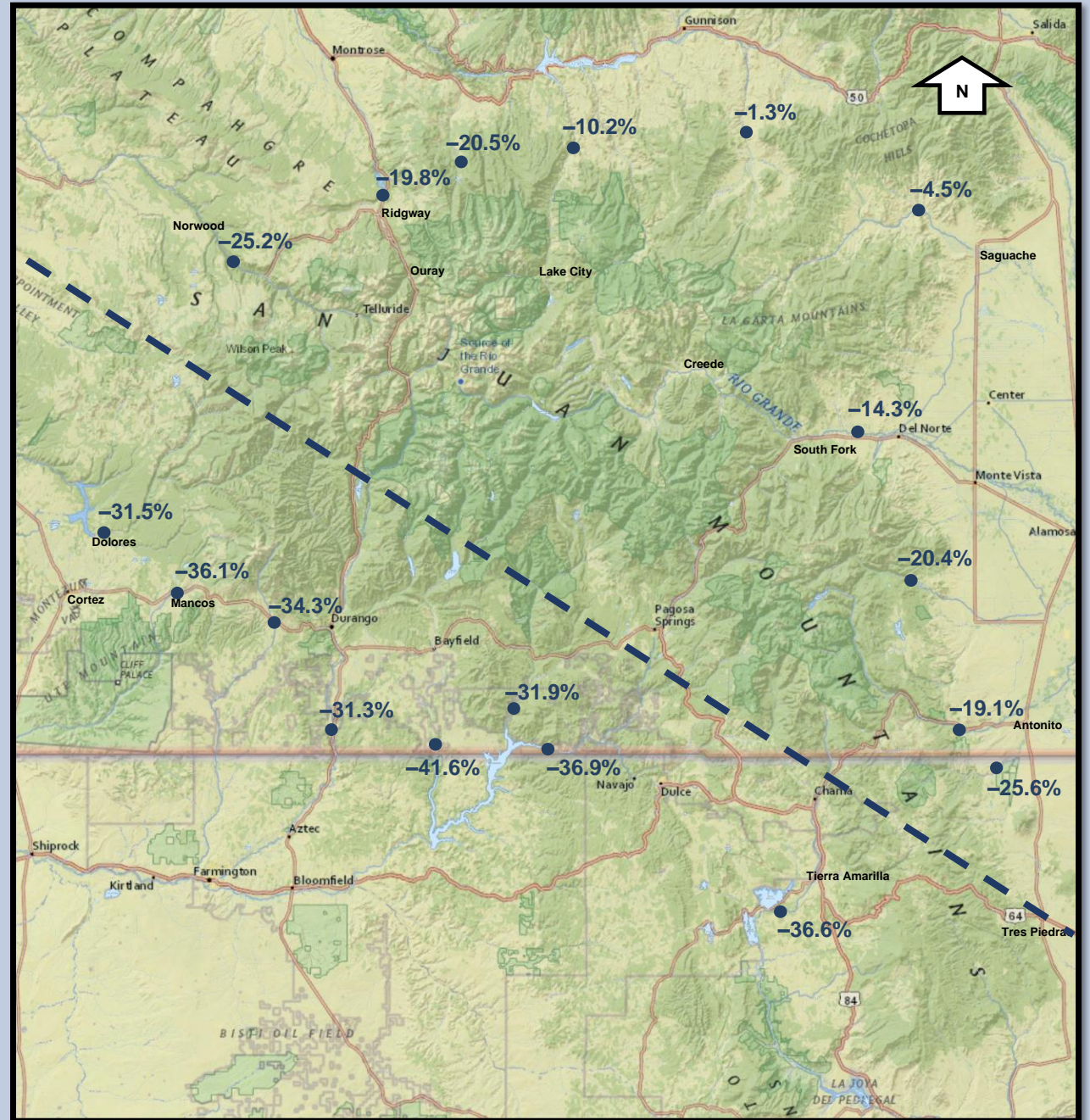
Stream Runoff – Annual

River Basin Comparison

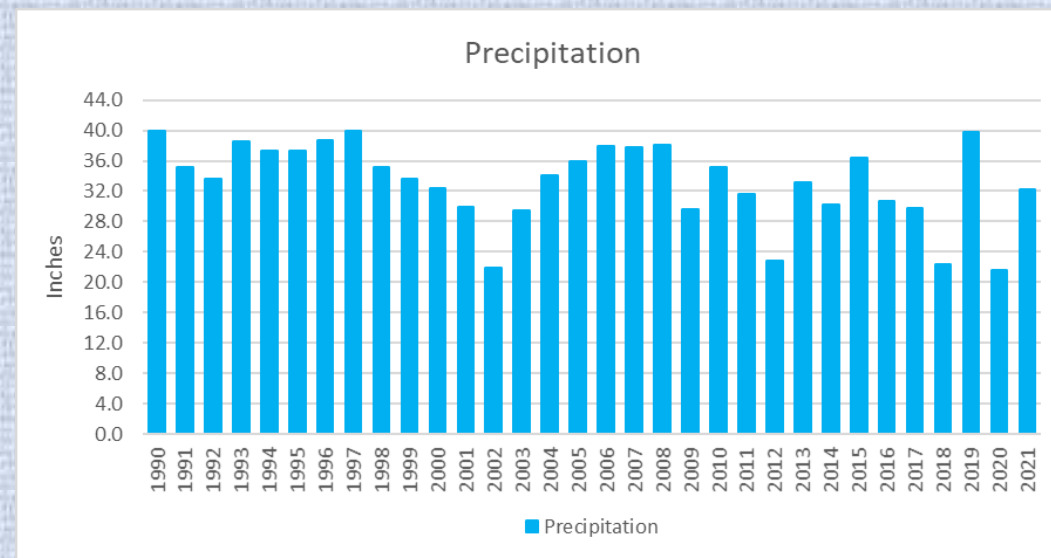
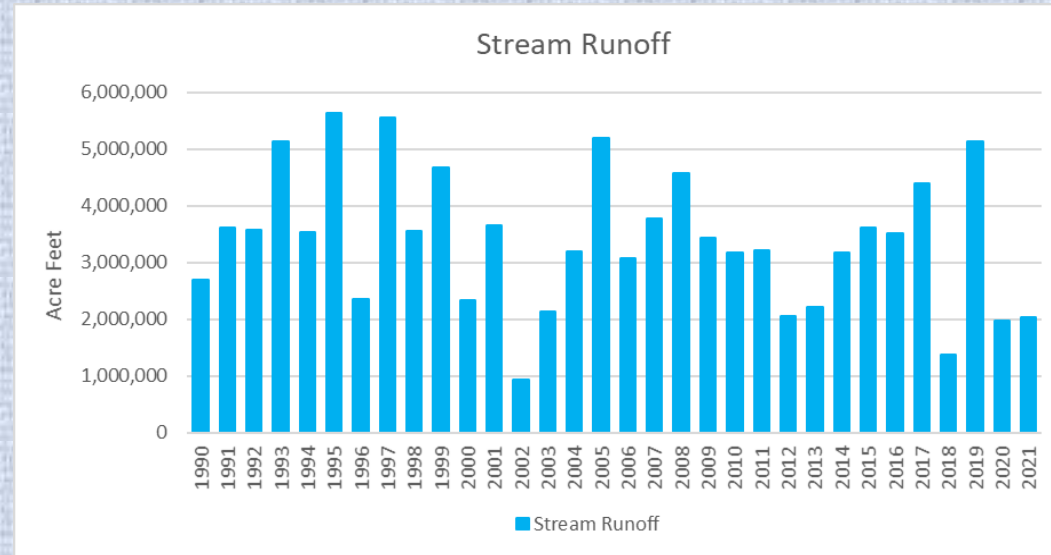


Stream Runoff Change

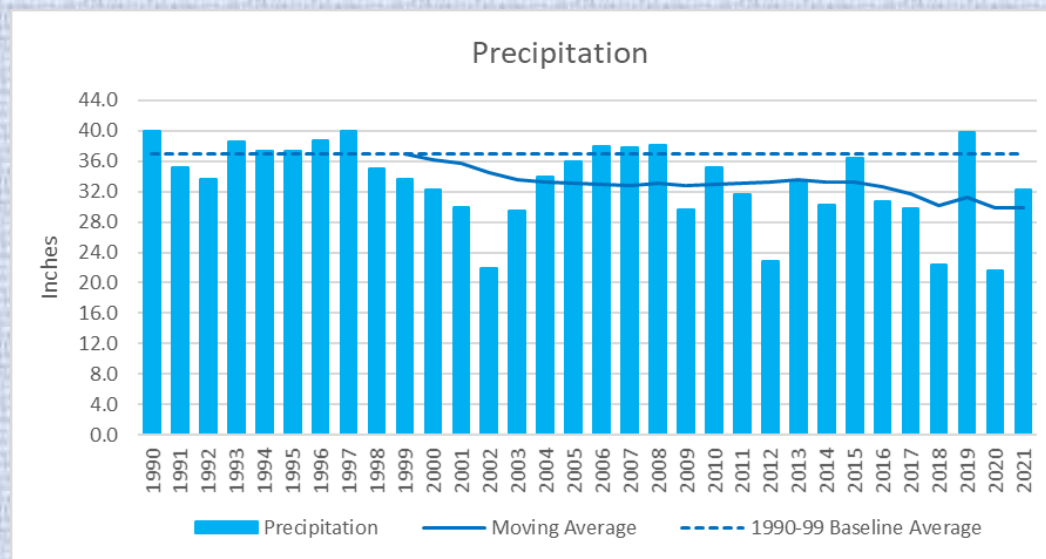
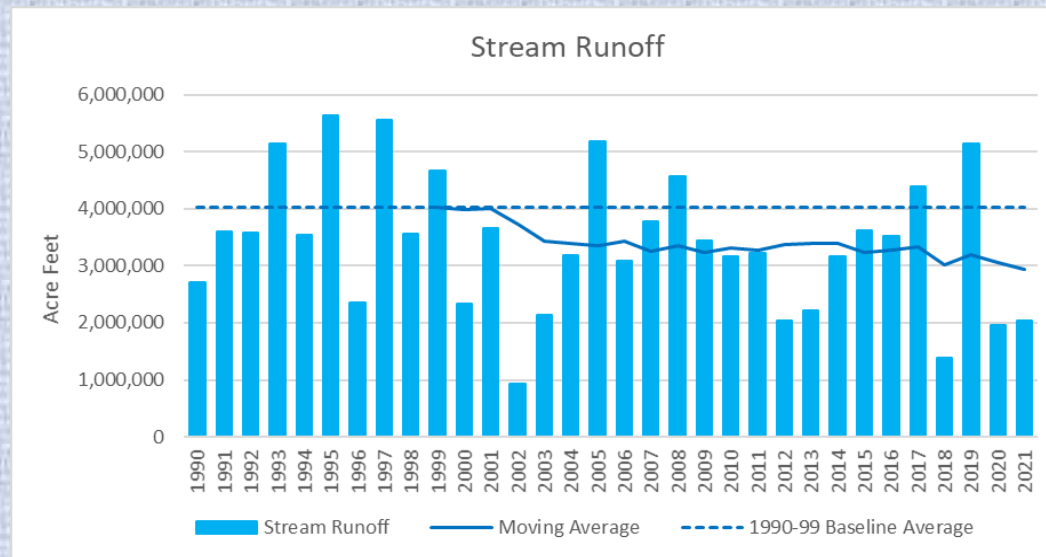
- Above average stream flow declines along south-southwest front
- Below average stream flow declines along north-northeast front



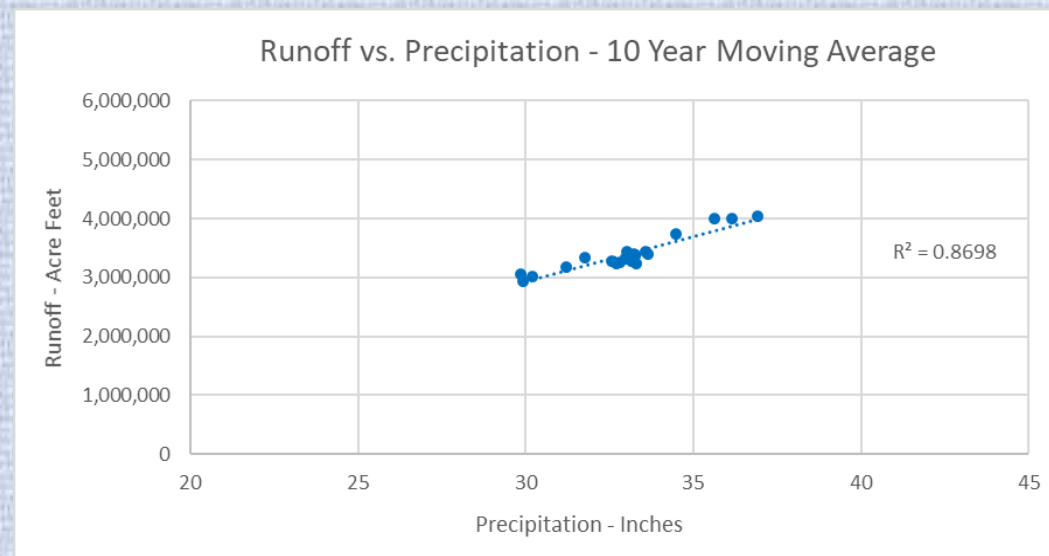
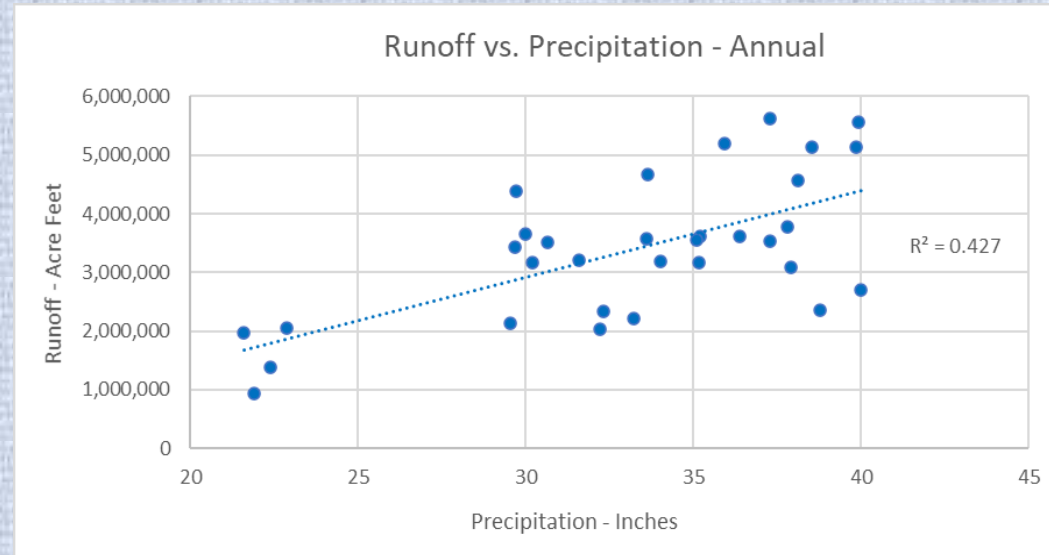
Stream Runoff vs. Precipitation



Stream Runoff vs. Precipitation



Stream Runoff vs. Precipitation



Final Thoughts



- **Summer/Winter seasonal transition months have shifted from October & April to November & March**
- **Most reliable snow accumulation months have been compressed into December, January & February**
- **Increased Winter precipitation is not sufficient to offset significant declines in Spring, Summer & Fall**
- **March & April are no longer likely to salvage a low precipitation Winter**



Questions?



Resources / Contacts

Water Information Program: <https://waterinfo.org/2022/04/11/san-juan-mountains-trends-in-precip-runoff-temp/>

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