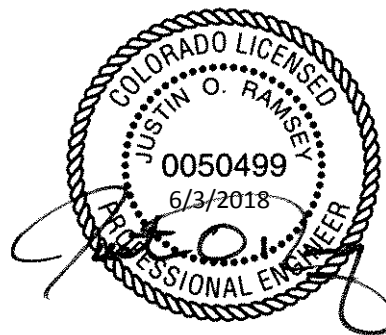




# 2018 Drought Management Plan

Pagosa Area Water and Sanitation District  
PO Box 4610  
Pagosa Springs, CO 81147  
970 731-2691

5/18/2018



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## I. INTRODUCTION

### I.1. PROFILE OF EXISTING SYSTEM

The Pagosa Area Water and Sanitation District (PAWSD) was established by general election in July of 1971 to provide water and wastewater service within the Archuleta County, Colorado area. In 1992 the Archuleta Water Company and Town of Pagosa Springs water was included into the PAWSD district. With the inclusion, PAWSD became owner of the Snowball Water Treatment Plant and the West Fork Diversion. The current PAWSD service area consists of 5,792 water connections and operates approximately 300 miles of water line and 90 miles of wastewater line. A map of the PAWSD service area is included as **Appendix A**.

In addition to the West Fork Diversion, PAWSD's raw water supply consists of surface water from the main stem of the San Juan River and Fourmile Creek. PAWSD's service area encompasses approximately 41,428 acres. A source water map of the raw water supply is included as **Appendix B**.

**Table I PAWSD Raw Water Diversions**

Location	Type
San Juan River (West Fork)	Box
San Juan River (Main Stem)	Box
Fourmile Creek	Weir

PAWSD currently has 4,070 acre-feet (AF) of usable raw water storage. Storage includes the following five reservoirs: Hatcher, Stevens, Pagosa, Village, and Forest. Hatcher Reservoir receives its water supply from Fourmile Creek through the Dutton Pipeline. The Four Mile Creek diversion is capable of diverting water to Hatcher Reservoir, Stevens Reservoir, or both. When Hatcher Reservoir is full, water is diverted to Stevens Reservoir. The lower reservoirs of Stevens, Pagosa, Village, and Forest are operated in series; when an upstream reservoir is full it spills into the downstream reservoir. For instance, when Stevens Reservoir is full it spills to Lake Pagosa through the Linn and Clark Ditch. When Lake Pagosa is full it flows through a series of golf course ponds and is conveyed to Village Lake. Village Lake spills into Lake Forest, where overflow then spills into Stollsteimer Creek feeding into the Piedra River prior to its confluence with the San Juan River at Navajo Lake. PAWSD can also pump raw water from the San Juan River through the San Juan Pipeline to the San Juan Water Treatment Plant (water cannot currently be sent directly to the San Juan Water Treatment Plant until a UV disinfection system is installed per state mandate; the system should be installed in 2019), Lake Forest or Village Lake via the San Juan diversion.

**Table 2 PAWSD Primary Water Supply Sources**

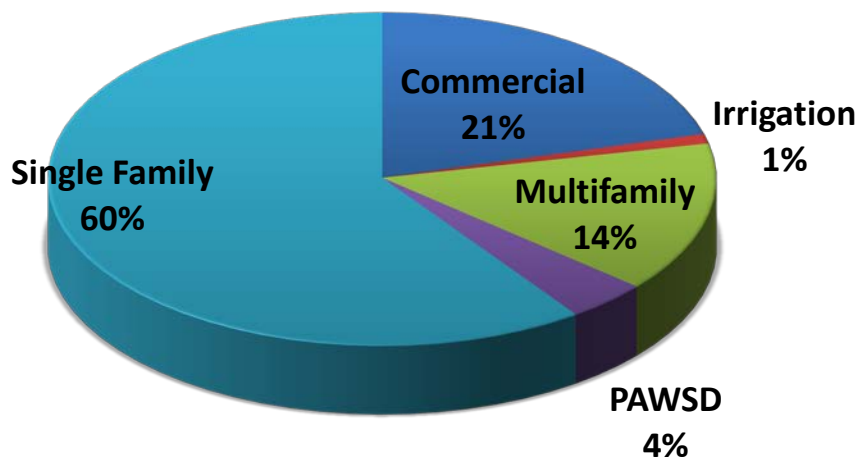
Reservoir	Usable Capacity (Acre Feet)	Primary Diversion	Diversion Rate (cfs)
Hatcher	880	San Juan River (West Fork)	5.0
Lake Pagosa	920	San Juan River (Main Stem)	8.0
Lake Forest	269	Four Mile Creek	12.8
Stevens	1730		
Village	228		

Table 3 provides PAWSD retail water deliveries by customer sector from 2013 to 2017 while Figure 1 illustrates average customer sector use based on 2013 through 2017 water deliveries.

**Table 3 PAWSD Retail Water Deliveries in Acre Feet (2013-2017)**

Location	2013	2014	2015	2016	2017
Commercial	227	235	234	242	245
Irrigation	16	17	13	18	22
Multi-Family	152	153	143	152	154
PAWSD	48	41	43	48	46
Single Family	627	630	599	670	701
<b>TOTAL</b>	<b>1071</b>	<b>1076</b>	<b>1032</b>	<b>1130</b>	<b>1167</b>

**Figure 1 - PAWSD Customer Water Use by Sector (2013-2017)**



Since water taken from Fourmile Creek, the San Juan River, and the area reservoirs constitutes a draw on available raw water supplies, PAWSD has determined that readings from the production meters on the water treatment plants (WTP) would be used to calculate annual water demand. Water produced at the PAWSD water treatment plants from 2008-2017 is included as **Appendix C. A**

preview of that data is shown below in Table 4. It should be noted that PAWSD has a contractual obligation with the Pagosa Springs Golf Club to provide raw water from Village and Pinon lakes for the purpose of irrigation. The required annual supply under this contract is 300 AF. Raw water is also provided to various condominium communities. Raw water is also pumped into Pinon Lake. PAWSD has no ability to recapture water from Pinon Lake and thus is unable to use this water for production. The raw water sales to the Golf Course, condominiums and water provided to Pinon Lake are shown in **Appendix C**.

The following table provides an overview of all PAWSD WTP production and average demand from 2008 through 2017.

**Table 4 PAWSD Water Treatment Plant Production and Estimated Demand**

	AF
WTP 2008 through 2017	17,254.03
Raw Water	5,206.04
Total AF 2008 – 2017	22,460.07
Average/year	2,246.01

Production 2001-2011	AF	Average
Hatcher	10,575	1,057.52
San Juan	956	95.57
Snowball	5,723	572.31

Area	Average (AF)
Production	1,724.40
Raw Water	520.60
<b>Total Average Water Produced</b>	<b>2,246.00</b>

The PAWSD service area encompasses the Town of Pagosa Springs as well as areas of Archuleta County. It is estimated that 75% of the population of Archuleta County lives within the PAWSD service area. The PAWSD service area population is estimated by multiplying the current population for Archuleta County by 75% (0.75). This methodology was supported in 2011 by a community Water Supply Work Group (WSWG) that assisted PAWSD in efforts to understand water use within its service area.

Population projection methods were analyzed by PAWSD for the 2018 Fee Study. The analysis indicated EU growth was occurring at approximately 1% annually and cumulative connections were increasing at approximately 3% annually. The PAWSD Board of Directors agreed to use a 2%

increase for estimated population growth. Table 5 summarizes this methodology showing population estimates and existing and projected annual EU increases.

**Table 5 Past, Current, and Predicted Population and Equivalent Units (EU's) served by PAWSD**

Year	Archuleta County Population Estimates	Archuleta County Population Estimate 75%	Estimated # of Equivalent Units	Residential Equivalent Units (85%)	Commercial Equivalent Units (15%)
2008	12,497	9,373	7,362.0		
2009	12,430	9,323	7,177.0	6,100.5	
2010	12,056	9,042	7,199.0	6,119.2	1080
2011	12,010	9,008	7,263.0	6,173.6	1084
2012	12,114	9,086	7,278.0	6,186.3	1084
2013	12,184	9,138	7,285.5	6,192.7	1100
2014	12,210	9,158	7,344.5	6,242.8	1122
2015	12,325	9,244	7,412.5	6,300.6	1150
2016	12,572	9,429	7,475.0	6,353.8	1184
2017	12,823	9,617	7,550.0	6,417.5	1226
2018	13,079	9,810	7,701.0	6,545.9	1269
2019	13,341	10,006	7,855.0	6,676.8	1313
2020	13,608	10,206	8,012.1	6,810.3	1359

2008 through 2015 actual Archuleta County population from United States Census Bureau

So as to better understand and quantify PAWSD’s current raw water supply and its ability to meet customer demands, PAWSD’s firm yield report is provided in **Appendix D**. It factors the current average annual customer demand (2,247 AF) and summer use in million gallons per day (MGD) against the raw water supplies available to PAWSD via the San Juan River, Fourmile Creek, and the five reservoirs. The report estimates that PAWSD has “over a two year water supply”.

## **I.2. DROUGHT MITIGATION AND RESPONSE PLANNING**

For the purpose of this plan, drought is defined and understood to be an extended period of time (months/years/decades) when a region is deficient in the delivery of its natural water supply. Generally this occurs when a region receives consistently below average precipitation for a given period of time; thus, resulting in a strain on the existing water supplies to meet the external demands placed upon it. Drought is a combination of naturally dry conditions that stress human water needs and result in water supply shortages.

PAWSD is fully reliant on surface water supplies that originate as snowfall and rain in the Upper San Juan Watershed Basin. As mentioned previously (see Table 1), PAWSD diverts surface water from the West Fork of the San Juan, the San Juan River and Fourmile Creek. PAWSD does hold some senior water rights on the West Fork of the San Juan and the San Juan River; however, water rights on Fourmile Creek are junior to others. This results in the water supply from Fourmile Creek being

“turned off” for most of the summer months as senior users draw their allotments primarily for irrigation. Fortunately, the senior rights on the West Fork of the San Juan and San Juan River allow PAWSD to draw their current facility maximums at both the San Juan Water Treatment Plant and Snowball Water Treatment Plant. Additionally, PAWSD has five reservoirs containing a total of approximately 4,027 AF of usable water.

The purpose of this document is to understand how the effects of drought can stress the water supply and the ways in which PAWSD can proactively deal with those stresses to fulfill its mission of providing safe drinking water to the Pagosa Springs community.

Drought response is comprised of the temporary actions required to maximize the existing water supplies due to anticipated water shortages caused by lack of precipitation.

The PAWSD Drought Management Plan has been constructed in compliance with the guidelines established by the Colorado Water Conservation Board (CWCB) Office of Water Conservation and Drought.

A copy of this plan is on file with Colorado Water Conservation Board as well as the Archuleta County Sheriff's Department Office of Emergency Management.

### **1.3. DROUGHT PLANNING AND WATER CONSERVATION**

The main objective of a water conservation plan is to achieve and realize long-term improvements in overall water use efficiency while simultaneously achieving a reduction in overall per capita water demand.

A Drought Management Plan, by contrast, focuses on dealing with the effects of drought in such a way as to provide short-term reprieve from temporary water supply shortages. Demand reductions are often achieved through voluntary and/or mandated water use restrictions designed to temporarily decrease water demand. Drought mitigation efforts are generally precautionary steps or actions taken prior to a drought situation to avoid or reduce the potential impacts.

Drought mitigation is a concerted effort to use all water wisely so as to eliminate unnecessary waste. This not only promotes responsible stewardship within the community, it also enables PAWSD to develop a thorough understanding of the service area's water needs. Drought mitigation efforts are generally precautionary steps or actions taken prior to a drought situation to avoid or reduce the potential impacts. Water conservation is considered a form of drought mitigation.

## **2. STAKEHOLDERS, OBJECTIVES, AND PRINCIPLES**

Since a drought event and the actions taken by PAWSD to combat the effects of a drought affect the entire community, PAWSD believes that incorporating a variety of perspectives from within the



community will produce a Drought Management Plan that will accurately and efficiently deal with the effects of drought in the most beneficial way. This includes operating principles that reflect the values of PAWSD as well as the community as a whole.

### **2.1. OBJECTIVES OF THE DROUGHT MANAGEMENT PLAN**

The following objective and operating principles were developed.

#### **2.1.1. Objectives of the Drought Management Plan**

The objective of the Drought Management Plan is to effectively address the needs of the community during times of water supply shortage while systematically enacting efforts to reduce demand so as to maximize current available water supplies.

#### **2.1.2. Principles of the Drought Management Plan**

The operating principles of the Drought Management Plan are as follows:

- PAWSD's top priority is to ensure essential public water service to the community during any level of drought severity.
- Consideration of the actions taken to ensure essential public water service will minimize adverse drought related impacts on public health and safety, economic vitality, and environmental resources.
- Provide a comprehensive yet flexible framework to guide PAWSD staff through drought mitigation and monitoring efforts as well as pre-scripted procedures to follow for communicating drought severity and implementing the actions required within the various drought stages.
- Effective communication of drought awareness, drought conditions, and response information to the community.
- Provide an efficient means to monitor and improve the effectiveness of the Plan over time.
- Provide sufficient contextual information in the Plan so as to convey the importance of drought preparedness and management to the public and how the actions set forth in this Plan are necessary to reduce drought-related impacts and ensure the health and safety of the community.

#### **2.1.3. Water Priorities**

Water use priorities are the ranking of the uses of water such that they ensure the welfare of the people and reflect the beliefs of the community. All water use restrictions and actions taken to secure the water supply will be managed according to the priorities listed below.

1. Health and Safety – Water uses essential to the public health and safety of the community. These include indoor water use, and community fire suppression.

2. Commercial / Industrial – water use necessary to ensure economic stability and/or prevent an unfair burden from befalling a narrow segment of businesses.
3. New Construction – intended to encompass practices such as dust mitigation and water intensive materials such as concrete.
4. Outdoor Irrigation of Landscapes – includes all outdoor water use such as water for ornamental gardens, turf grass areas, and water fountains and features.

All water use can be grouped into at least one of three categories; Essential, Social/Economic, and Non-essential. Essential water use priorities are just that, essential for the health and safety of people. Social/Economic water use priorities are essential for the health of the business community as well as the social fabric of the community. Non-essential water use is comprised of activities that can temporarily be reduced or stopped without significantly affecting public health and safety or economic/social priorities.

### 3. HISTORICAL DROUGHT AND IMPACT ASSESSMENT

#### 3.1. HISTORICAL ASSESSMENT OF DROUGHT, AVAILABLE SUPPLIES, AND DEMANDS

Severely decreased precipitation in the fall of 2001 and winter/spring of 2002 set the stage for the summer of that year. Historically the San Juan River generally sees peak flows in early to mid-May of any given year with a recorded flow of approximately 2000 cfs. As shown in Table 4 below, in 2002 the seasonal peak flow of the San Juan River was recorded on April 15 at a mere 235 cfs. That same month, PAWSD’s primary water reservoir, Lake Hatcher, was entering the high demand summer season holding only 62% of its usable capacity. The District holds junior water rights on the Dutton Ditch which is the main water supply to Hatcher reservoir. The water right holders in priority left very little water unused. As such, water levels in Hatcher and all the successive reservoirs continued to fall (see PAWSD Reservoir Storage Levels - **Appendix E**). Water quality in the reservoirs was compromised as falling water levels led to overall warming which promoted large algae blooms and fish die-offs. It was October before the rains fell and reservoir levels and river flows began to increase.

**Table 6 PAWSD San Juan River Peak Flows 2000 - 2004**

Year	Peak Flow (cfs)	Date
2000	1,120	May 8
2001	2,940	May 17
2002	235	April 15
2003	2,040	May 29

2004	1,860	May 11
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\* data provided from USGS gauging station 09342500 in Pagosa Springs, CO

Each year PAWSD relies on winter precipitation to provide the water to fill the reservoirs. When those precipitation events are compromised, so is PAWSD’s ability to secure the water supply for the high demand months of summer. Table 7 shows the historic measured precipitation in the Upper San Juan Basin for the years preceding and following the drought of 2002.

**Table 7 Historic Measured Precipitation 2000-2003**

Upper San Juan Precipitation	Historic Monthly Average (in)	2000 (in)	% of Historic Average	2001 (in)	% of Historic Average	2002 (in)	% of Historic Average	2003 (in)	% of Historic Average
Jan	5.5	1.8	33%	3	55%	0.8	15%	1.4	25%
Feb	5.6	5.2	93%	4.5	80%	1	18%	4.5	80%
Mar	6	5.6	93%	4	67%	5.2	87%	4.2	70%
Apr	4.4	1.9	43%	7.8	177%	0.6	14%	2.4	55%
May	2.9	1	34%	2.3	79%	0.1	3%	1.6	55%
Jun	1.6	0.1	6%	0.6	38%	0.2	13%	0.5	31%
Jul	2.9	0.4	14%	2.8	97%	0.9	31%	0.6	21%
Aug	3.7	2	54%	2.3	62%	1.1	30%	2.2	59%
Sep	3.9	1.2	31%	0.4	10%	0.9	23%	3	77%
Nov	4.8	4.8	100%	1.3	27%	3.9	81%	1.1	23%
Dec	5.5	4.3	78%	1.1	20%	3.3	60%	8.9	162%

from: [www.wcc.nrcs.usda.gov/reports](http://www.wcc.nrcs.usda.gov/reports)

### 3.2. HISTORICAL DROUGHT IMPACT, MITIGATION AND RESPONSE ASSESSMENT

The following are impacts experienced by PAWSD and the Pagosa Springs community during the drought of 2002:

#### 3.2.1. Impacts to PAWSD’s ability to provide water service

- Loss of revenue from a reduction in overall water sales.
- Reduction in raw water storage reserves.
- Fourmile Creek water supply was severed early due to the demands of senior water rights holders on the Dutton Ditch.
- Degraded water quality due to low reservoir levels which resulted in higher water treatment costs.
- Once a declaration of drought was made and the drought plan put into place, additional staff time and effort was required.

- The public perception of PAWSD's efforts to reduce water demand was less than favorable due to an aggressive rate structure adjustment and drought surcharge that were applied to all accounts.
- Additional costs to increase water use efficiency.

### **3.2.2. Community impacts experienced due to drought**

- Domestic and public landscapes stressed or killed due to water use restrictions.
- Overall water quality was compromised at times due to low reservoir levels and stream flows. This led to drinking water with an objectionable taste and odor.
- The Missionary Ridge Fire burning outside of Durango blackened the skies with smoke and ash. This led Archuleta County residents to be concerned over fires that may start closer to home and could have negative effects on the drinking water supply.
- When water use restrictions were implemented there was little consideration given to the difference between commercial and residential users. This resulted in an unfair burden befalling certain commercial sectors such as hotels, car washes, and plant nurseries.
- A heightened awareness about the importance of water conservation.
- Water use behaviors changed which led to a re-evaluation of social norms and values (e.g., priorities, needs, rights).

### **3.2.3. Economic impacts experienced due to drought**

- Much of the appeal to the Pagosa Springs area is found in the natural environment. Decreased flows in the San Juan River and many other tributary streams led to a reduction in tourist visits from those wanting to fish or raft those waters. Restrictions limiting access and activities in the National Forest areas surrounding town also kept people away.

### **3.2.4. Environmental impacts experienced due to drought**

- The lack of precipitation led to a dry and stressed natural environment that was ripe for wildfires.
- Drought conditions and low stream flows caused stress to fish and wildlife.
- Low lake and reservoir levels gave rise to algae growth that affected water quality.

### **3.2.5. Mitigation measures implemented to minimize 2002 drought impacts**

By May of 2002, it was quite clear that the summer months to come were going to be long and dry. PAWSD began working to prepare for the implementation of drought management activities.

The following actions were directed by the PAWSD Drought Management Plan in place in 2002 -

May 1, 2002

- Public notified of voluntary water use restrictions which encouraged but did not require water conservation activities.

June 1, 2002

- Public notified of mandatory Level One water use restrictions. These restrictions included:
  - Irrigation of lawns and landscapes between the hours of 8pm to 8am only.
  - Even numbered addresses could irrigate on even number calendar days while odd numbered addresses could irrigate on odd numbered calendar days.
  - Failure to comply with restrictions could result in a fine.
  - Water conservation material disseminated to the public.

July 1, 2002

- Public notified of mandatory Level Two water use restrictions. These restrictions included:
  - Irrigation of lawns between the hours of 8pm and midnight only 1 day per week based upon street address.
  - Rate structure per 1000 gallons used adjusted to reflect scarcity.
    - Existing Rate Structure
      - 0-8,000 gallons included in monthly service charge of \$13.50/EU
      - 8,001 – 20,000 gallons - \$3.50/1000
      - 20,001 and up - \$4.50/1000
    - Level Two drought rate adjustment
      - 0-8,000 included in monthly base rate charge of \$13.50/EU
      - 8,001 – 20,000 gallons – \$14.00/1000
      - 20,001 – 30,000 gallons - \$22.50/1000
      - 30,001 – 40,000 gallons - \$27.00/1000
      - 40,001 – 50,000 gallons - \$31.50/1000
      - Usage above 50,001 gallons - \$90.00/1000
  - A drought surcharge of \$5.25/EU added to each account to offset the additional cost related to increased pumping from the San Juan River and power demands.
  - Water conservation material disseminated to the public.

Level Two water restrictions remained in effect through August and were then reduced to Level One restrictions until October 15, 2002 when all water use restrictions were lifted with the exception

of the \$5.25/EU drought surcharge, which remained in place until June 2003 when PAWSD implemented a multi-tiered billing structure.

During the drought of 2002, PAWSD enacted voluntary and then mandatory water use restrictions. The restrictions accomplished short-term demand reductions during the drought. They also produced noticeable water use reductions that persisted into 2003. The amount of water produced in 2002 was approximately 324.25 AF *less than* the amount of water produced the year previous in 2001.

While PAWSD succeeded in reducing its overall water demand in 2002, the implementation of the drought restrictions had some severe and unintended consequences.

- When Level Two restrictions went into effect there was little consideration given as to how it would negatively affect businesses that have little or no control over their water use or where water use was essential to business (i.e., hotels, garden centers/plant nurseries, commercial car washes, etc.). For example, a 1 EU home or business that used 50,000 gallons of water would normally bill at \$197.50 under the non-drought rate structure in place at the time. Under the Level Two Water Restriction rate structure, that same account would bill at \$991.50. The problem was compounded when PAWSD staff realized that there had been a historic under-assessment of EUs on many commercial accounts which caused the financial burdens to balloon.
- Many of these businesses argued that since they had no control over how their patrons used water or, in the case of plant nurseries and car washes, the amount of water necessary to remain in business, they should be exempt from the severity of the rate structure increases. In September 2002, the PAWSD Board of Directors agreed with the business owners and directed staff to reassess the EUs assigned to all area businesses and make the necessary billing adjustments.
- Another unintended but positive side effect of the Level Two rate structure was that PAWSD customers that had known water leaks that were previously deemed uneconomical to repair were finally repaired due to the financial burdens they presented if left unattended.

## **4. DROUGHT VULNERABILITY ASSESSMENT**

### **4.1. WATER SUPPLY AND DROUGHT MANAGEMENT PLANNING**

When surface water supplies decrease due to abnormal, below average precipitation events (short or long term) more water must be taken from storage to meet demand. The reliability of the water supply is a function of how well the available supplies will meet demand over time and under various hydrologic conditions.

Water supply reliability is defined as the ability of the provider's raw water supply system to meet the demands placed upon it. Water supply reliability planning differs from drought planning in that Drought Management Planning is the exercise of short-term water demand reduction activities implemented by the provider to extend usable water supplies and lessen drought impacts.

Short-term water supply reliability planning looks at the total available water supply expected for the year (based upon winter snowpack, San Juan River flows, and reservoir levels) and contrasts it to the forecasted demand for that year. Should there be a concern whether anticipated supply will meet the demand, drought planning efforts will begin internally prior to an official public declaration of drought.

Long-term water supply reliability efforts consist of actions to secure and hold as much water as possible. Doing so will ensure that PAWSD will have adequate supplies to meet demand during times of drought.

### **4.2. DROUGHT IMPACT ASSESSMENT**

Drought brings with it a multitude of impacts. PAWSD is committed to ensuring essential public water service to the community during any level of drought severity. Consideration of the actions taken to protect this first commitment will be such that they minimize, as much as possible, any adverse drought related impacts on public health and safety, economic vitality, or environmental resources. PAWSD realizes the importance of a continuous flow in the San Juan River and will cooperate to maintain a minimum flow in the river. The tables below highlight potential impacts that may be experienced by PAWSD and/or the community. It is intended that by identifying the impacts, the level of vulnerability, and the impact priorities, PAWSD will be prepared to allocate resources when and where they are most needed.

Drought impact vulnerability is understood to mean the level of exposure PAWSD and/or its constituents have to conditions or situations brought about by a drought event. If PAWSD or its customers have a high probability of being affected by an impact, a vulnerability of 1 was assigned. If the impact is somewhat likely, a vulnerability of 2 was assigned. If an impact was not likely but still possible, a vulnerability of 3 was assigned. Determination of how vulnerable PAWSD and its customers are to each impact was achieved through work performed by the Drought Committee in 2012.

The priority (high, medium, low) assigned a drought related impact is directly correlated to the established water use priorities listed in Section 2.2. All impacts that could affect the health and safety of the community are given a priority listing of HIGH. All impacts that affect District funds or operations, community economics, or businesses are given a priority listing of MEDIUM, and all impacts that affect landscapes (public or private) or visual appeal are given a priority listing of LOW as they are not an essential use of water.

The boxes below highlight impacts that could be experienced by PAWSD (the provider), the community, the economy, as well as the environment and recreational sectors.

<b>Future Provider Drought Related Impacts</b>	<b>Potential Impact Priority</b>
Loss of revenue from reduction in water sales	Medium
Reduction in storage reserves	High
Disruption of water supplies	High
Degraded water quality	High
Higher treatment costs	Medium
Increased costs and staff time to implement Drought Plan	Medium
Increased data/information needs to monitor and implement drought mitigation plans	Medium
Costs to acquire/develop new water supplies/water right transfers	Medium
Costs to increase water use efficiency	Medium
Public perception of PAWSD during drought mitigation efforts (+/-)	Medium

<b>Future Community Drought Related Impacts</b>	<b>Potential Impact Priority</b>
Domestic landscaping stressed or killed	Low
Public landscaping stressed or killed	Low
Lower quality drinking water (poor taste, odor)	High
Reduced quality of life	High
Public safety from wildfire	High
Reduction or modification of recreational activities	Low
Heightened awareness about the importance of water conservation	High
Change in water use behavior to conserve water	High
Re-evaluation of social values (priorities, needs, rights)	Medium

<b>Future Economic Related Impacts</b>	<b>Potential Impact Priority</b>
Loss to recreation and tourist industry	Medium
Water Use restrictions harm businesses (landscapers, car washes etc.)	High
Impacts to large scale commercial users	Medium



Future Environmental and Recreational Impacts	Potential Impact Priority
Increased risk of frequency and severity of wildfires	High
Exacerbation of beetle kill in forests	Low
Stress to the surrounding environment	Medium
Loss of wetlands	Low
Lower stream flows	High
Lower lake and reservoir levels	High
Deterioration of air quality	Medium
Compromised visual and landscape quality	Low
Stress to fish and wildlife	Medium
Lower water quality in streams, lakes, and reservoirs	High
Campfire bans	High
National Forest access restricted	Medium

## 5. DROUGHT MITIGATION AND RESPONSE STRATEGIES

Drought mitigation efforts are both short and long-term actions taken to ensure, to the greatest extent possible, the reliability of the water supply. Drought mitigation differs from drought response mostly in timing and implementation requirements. Mitigation efforts are generally voluntary long-term water use modifications to improve water supply reliability while drought response efforts may be more reactive to an observed reduction in water supplies.

### 5.1. DROUGHT MITIGATION MEASURES

The drought mitigation measures to be employed by PAWSD are as follows:

- Regular monitoring of early drought indicators such as winter snowpack and current stream flow.
- Ensure the reservoirs remain as full as possible.
- Installation of additional Solar Bees and maintenance of current Solar Bees will continue so as to increase water quality.
- Ensure the integrity of the water distribution system through a vigilant maintenance and repair program.
- Promotion of water efficient retro-fitting in residential and commercial structures.
- Encourage regionally appropriate plants and landscaping.
- Encourage water conservation.

Water conservation efforts apply to both the provider and the customer and are generally long-term efforts to firm-up water demand. There will come a time when existing water supplies and treatment facilities will need to be expanded to meet demand. Through water conservation it is possible to

prolong the usability of existing water supplies and facilities which represents an avoided cost savings to both the provider and customer. Expanding the usability of water resources is a form of drought preparedness and mitigation.

### **5.2. SUPPLY-SIDE RESPONSE STRATEGIES**

Drought response strategies are generally short-term actions to reduce demand and prolong the available water supply. PAWSD response strategies can be grouped into six distinct fields; Elements of a Drought Plan, Emergency Response, Public Education and Community Relations, Water Supply Security, Water Rights Management and Cooperative Agreements, and Water Distribution System Efficiency.

#### **Elements of a Drought Plan**

- Continue monitoring drought indicators such as remaining snowpack, current stream flows, and precipitation.
- Track public perception and effectiveness of enacted drought measures to gauge community sentiment and overall plan effectiveness.

#### **Emergency Response**

- The case of a drought emergency, PAWSD will make an official declaration of drought prior to enacting any drought level requiring mandatory water-use restrictions.
- The installation of new taps may be prohibited.
- Should the drought situation warrant, PAWSD may look to the State and Federal Government for assistance.

#### **Public Education and Community Relations**

- Develop education and awareness campaigns specific to the needs of our community
- Track public perception and response to drought materials and the efforts of the education and awareness campaign.

#### **Water Supply Security**

- Ensure maximum and reliable raw water supply by ensuring all reservoirs are as full as possible for as long as possible.
- Develop a contingency plan should diversions by senior right holders affect PAWSD's ability to meet demand.
- Ensure water treatment plant technology is able to efficiently treat water of low quality.

#### **Water Rights Management and Cooperative Agreements**

- Compensate senior water right holders to NOT place a curtailment order that would affect PAWSD's supply.
- Lease irrigation rights from farmers.
- Purchase additional water rights.
- Renegotiate contractual water delivery obligations.
- Compensate upstream users to allow more water to flow downstream.

### **Water Distribution System Efficiency**

- Conduct distribution system audits to identify areas of potential water loss.
- Identify and repair distribution system leaks.
- Reduce system pressure to decrease water loss.
- Evaluate current facility and equipment operations in order to optimize efficiency and distribution of water supplies

## **5.3. DEMAND-SIDE RESPONSE STRATEGIES**

The following demand-side response strategies involve actions to be taken by PAWSD, both internally and externally, to encourage water conservation and temporarily reduce water demand.

### **- PAWSD**

- Develop education and awareness campaigns specific to the needs of our community that addresses the need for short-term water reductions
- Implement a drought surcharge and/or a temporarily modified billing structure to ensure financial stability during times of decreased revenues related to drought.
- Enact mandatory water use restrictions per the Plan.
- Limit fire hydrant flushing.

### **- Residential**

- Limit outdoor watering of landscapes to certain times/days per the level of drought severity.
- Ensure all lawn and landscape watering restrictions are known (see 4.4 Public Information Campaign).
- In times of serious drought, the application of water to landscapes and gardens (e.g., edible and ornamental) will be limited to hand watering only.
- Use the AMI system to identify potential leaks and initiate customer contact.
- Encourage efficient irrigation practices.
- Discourage water waste.
- Continue water conservation and education efforts.

### **- Commercial / Industrial**

- Ensure any water restrictions impacting this sector are known.
- Discourage any waste of construction water.
- Limit outdoor watering of landscapes to certain times/days per the level of drought severity.
- Promote the installation of water efficient technologies where applicable.
- Promote the serving of water in restaurants only upon request.
- Use the AMI system to identify potential leaks and initiate customer contact.
- Continue water conservation and education efforts.

## 5.4. PUBLIC INFORMATION CAMPAIGN

PAWSD recognizes the power of public education and awareness. A public drought campaign raises community awareness of the drought situation and paves the way for responsive demand reduction.

The goal of the Public Information Campaign is to ensure that the community is made fully aware of the water supply situation and any associated water use restrictions that may occur during the drought event and why the restrictions being imposed are necessary.

The general components of the Campaign will include:

- Timely and reoccurring media releases notifying the public of current drought conditions and encouraging short-term reductions in water use.
- Direct mailings to customers advising them of the current level of water use restrictions and what water use restrictions are entailed in the current drought level.
- The use of the AquaHawk customer portal advising customers of current water use restrictions and drought levels.

Examples of the components of the Public Information Campaign can be found in **Appendix F** and **G**.

## 6. DROUGHT STAGES, TRIGGER POINTS, AND RESPONSE TARGETS

### 6.1. DROUGHT STAGES, TRIGGER POINTS, AND RESPONSE TARGETS

Appropriate drought indicators used by the District to understand and/ or forecast drought periods will be snowpack, precipitation, and snow water content as a percentage of historic average. This information will be gathered primarily from the [National Resource Conservation Service](#) (NRCS) and the [NIDIS US Drought Portal](#).

Observed changes in water supply availability (e.g., reservoir levels, stream flows) are indicative of potential drought. The importance of pairing these observables changes with precipitation data cannot be overstated.

PAWSD monitors and measures the water levels in all five reservoirs from April – November or as long as the water surface is free of ice.

Trigger points serve as thresholds for action. Once the requirements set for a trigger point have been met or exceeded, the actions outlined in the corresponding drought stage are followed in an effort to achieve a water reduction goal intended to extend current water supplies. The primary trigger points established by PAWSD are based upon the current amount of raw water storage in the reservoirs as well as water coming into the system (i.e., inflow) from the San Juan River or Fourmile

Creek in relation to anticipated water production needs. Secondary trigger points for voluntary water reduction steps include a Snow Water Equivalent (SWE) of less than 75% of median as measured by the USGS Upper San Juan SnoTel site or a curtailment order on Fourmile Creek prior to May 1.

The table below shows the drought stages, their corresponding trigger point thresholds, the amount of water consumed from the system, the amount of water remaining, and the demand reduction goal.

To better understand the acre-feet used and acre-feet remaining sections of the table, it should be noted that PAWSD has a total usable reservoir storage capacity of 4,027 acre-feet. To cross the trigger point threshold, assuming neither of the secondary triggers is met, for voluntary reduction would require the total volume of all 5 reservoirs to be down 402.7 acre-feet minus inflow from Fourmile or San Juan Diversions. Should this happen there will be approximately 3624.3 acre-feet remaining in the reservoirs and inflow from inflow from Fourmile or San Juan Diversions.

The water demand reduction goals were determined by a Drought Committee in 2012 as well as through the reading of other Colorado municipal Drought Management Plans. It was determined that in the most severe of drought scenarios, a 50% reduction in demand would be required. The water industry has long held that approximately 50% of residential summer water use is the irrigation of lawns and landscapes. Therefore, were PAWSD customers to simply stop all outdoor irrigation, demand would decrease by the desired 50%. The water use restrictions associated with each drought stages are specifically targeted towards irrigation activities and ways in which those can be reduced and/or monitored for compliance.

**Table 8 Drought Stages, Trigger Points, and Demand Reduction Goals**

Drought Stages	Trigger Points	AF Used	AF Remaining	Water Demand Reduction Goals
Voluntary reduction	≥ 90% Storage + Inflow SWE >75% of median Curtailment Order on Four Mile Creek Diversion prior to May 1	403	3624	0 – 10%
Level 1	≥ 70% Storage + Inflow	1208	2819	10 – 20%
Level 2	≥ 50% Storage + Inflow	2013	2013	20 – 30%
Level 3	≥ 40% Storage + Inflow	2416	1611	30 – 40%
Level 4	≥ 30% Storage + Inflow	2819	1208	40 – 50%

Voluntary water reduction is intended to give the community advance notice of developing drought conditions and begin to foster water conservation and voluntary water use reduction. It is intended that water demand should decline by 0-10% based upon the average of three previous years' water demand.

### Level 1 – Low

This stage builds upon the efforts of Voluntary Reduction stage while incorporating basic mandatory water use restrictions aimed mostly at curbing excessive outdoor irrigation of lawns and landscapes. A declaration of Level One will be accompanied by an increased community outreach and awareness campaign. This stage will include a drought surcharge. It is intended that water demand should decline by 10-20% based upon the average of three previous years' water demand.

### Level 2 – Moderate

This stage is an advance notice of severe drought conditions. Mandatory water use restrictions are amplified to promote water conservation and curb water consumption. A declaration of Level Two will be accompanied by a more aggressive community outreach and awareness campaign. This stage, in addition to the drought surcharge, will include a modified water use rate structure. It is intended that water demand should decline by 20-30% based upon the average of three previous years' water demand.

### Level 3 – Serious

This stage serves as notification of severe drought conditions that threaten water availability. Mandatory water use restrictions are further amplified to curb water consumption and extend the usability of current water supplies. The drought surcharge will remain and the water use rate structure will be further modified. A declaration of Level Three will be accompanied by an even more aggressive community outreach and awareness campaign. It is intended that water demand should decline by 30-40% based upon the average of three previous years' water demand.

### Level 4 –Severe

This stage is the most severe, indicating dangerously low water supply levels that could affect PAWSD's ability to provide essential water service. The drought surcharge will remain and the water use rate structure will be further modified. It is intended that water demand should decline by 40-50% based upon the average of three previous years' water demand.

## 6.2. DROUGHT DECLARATION AND PREDICTABILITY

As a headwaters locale, PAWSD is entirely dependent upon surface water. The amount of water available as well as when that water is available is subject to the patterns of nature. A winter of record snowfall followed by a spring of record heat can be just as devastating on the water supply as a winter of below average snowfall. Annual monsoon rain events, which generally occur in mid-July, serve to bolster stream flows and decrease demand (due to less irrigation) but these too can be unreliable. Also, the monsoon rains, though serving to decrease demand temporarily, do little to raise reservoir levels.

### **6.3. DROUGHT INDICATORS**

#### **1. Snowpack/Snow Water Equivalent (SWE)**

Definition - a measurement of the amount of water contained within the snowpack. It can be thought of as the depth of water that would theoretically result if you melted the entire snowpack instantaneously.

Operation – SWE will be monitored beginning March 1 of each year. Current SWE conditions will be judged based upon percent of median.

#### **2. Surface water run-off**

Definition – the flow of water from rain, snow melt, or other sources over the land.

Operation – Surface water run-off will be monitored on the San Juan River and Fourmile Creek beginning April 1 of each year with special attention being paid to the date of peak run-off.

#### **3. Reservoir Levels**

Definition – measurement of the level of the surface of a reservoir as it relates to full capacity.

Operation – Water levels of all five reservoirs will be gathered weekly beginning April 1 of each year.

#### **4. Water Inflow**

Definition – water entering the water supply system from surface water sources.

Operation – Monitoring of the amount of water being diverted from the San Juan River and Fourmile Creek is ongoing, but special attention will be given to these inflows during times of peak demand.

The monitoring efforts listed above will be entered into a water supply database that will serve to catalog the dynamic activity of current water supply and the anticipated water availability. The effort to monitor water supply conditions is ultimately a mechanism for PAWSD to better understand the water supply system as well as predict the potential severity of a drought.

See Section 8.2 for additional information on the monitoring of drought indicators.

### **7. STAGED DROUGHT RESPONSE PROGRAM**

PAWSD will make every effort to insure that the maximum amount of water available is being captured. In 2002, this commitment amounted to placing sandbags in the San Juan River to increase

the water level and direct maximum water flow into the diversion structures. It is worth mentioning that in July of 2002 when the USGS gauging station located in downtown Pagosa Springs was registering San Juan stream flows as low as 16 cfs, PAWSD was still able to draw its full facility maximums from the West fork and San Juan Diversions. However, senior water rights exist on the San Juan River that may affect the amount of water PAWSD is able to draw in a future drought event.

The majority of PAWSD’s water demands occur during the summer months when the effects of drought are most pronounced. PAWSD has chosen to focus demand reduction efforts on irrigation and outdoor water use. PAWSD also seeks to reduce water use through its public education and water conservation efforts.

Within each drought stage there is a targeted demand reduction goal, the actions to be taken to achieve that goal, and the preservation focus. As shown in Table 9, mandatory water use restrictions do not go into effect until Level 2 where irrigation is limited to evening, night, and morning hours, but is permitted seven days per week. Level 3 reduces irrigation days to every-other, allowing for 2-3 watering days per week (irrigation is not allowed on weekends). Level 4 permits irrigation only one day per week so as to sustain landscapes. Level 5, being the most severe stage, prohibits outdoor watering of landscapes all together.

An overview of irrigation-specific water use restrictions is shown below.

**Table 9 – Demand Reduction Goals, Options, and Focus**

Drought Stages	Demand Reduction Goal	Demand Reduction Focus Option	Focus
Voluntary	00 - 10%	Public education and awareness	Encourage responsible water use
Level 1 Low	10 - 20%	Irrigation allowed from 9 PM – 9 AM Drought Surcharge shall be applied	Keep all landscapes elements alive
Level 2 Moderate	20 - 30%	Irrigation allowed from 9 PM to 9 AM Odd/Even watering days based upon address Drought Surcharge shall be applied Tier charge multipliers shall be applied.	Preserve landscape elements such as trees, shrubs, gardens, and turf grass



Level 3 Serious	30 - 40%	Irrigation allowed from 9 PM to 9 AM 1 day per week based upon address  Drought Surcharge shall be applied  Tier charge multipliers shall be applied	Sustain certain landscapes elements such as trees, shrubs, and gardens while allowing turf grass to go dormant
Level 4 Severe	40 - 50%	No irrigation of outside landscapes  Drought Surcharge shall be applied  Tier charge multipliers shall be applied.	Recognize that landscape die-off may occur

Table 10 highlights the drought stages, response targets, and summarizes the drought response measures to be implemented.

**Table 10 – Mandatory Water Use Restrictions**

Drought Stages	Demand Reduction Goal	Mandatory Water Use Restrictions
Voluntary	00 - 10%	None
Level 1 Low	10 - 20%	Irrigation is permitted only between 9 PM – 9 AM  Gardens (edible and ornamental) may be hand watered using a hose or drip irrigation  Restaurants encouraged to serve water only upon the request of customers.  Hotels encouraged to replace towels and bed linens for new guests and at the request of existing guests.
Level 2 Moderate	20 - 30%	Irrigation permitted only between 9 PM to 9 AM based upon address  Odd numbered addresses may irrigate on odd numbered calendar days while even numbered address may irrigate on even numbered days  Irrigation is permitted Monday – Friday Only. Weekend watering is prohibited.  Gardens (edible and ornamental) may be hand watered using a hose or drip irrigation.  Restaurants shall serve water only upon the request of customers.  Hotels encouraged to replace towels and bed linens for new guests and at the request of existing guests..

Level 3 Serious	30 - 40%	<p>Irrigation permitted only between 9 PM to 9 AM based upon address</p> <p>Irrigation is permitted Monday or Thursday only depending on address. Watering on other days is prohibited.</p> <p>Gardens (edible and ornamental) may be hand watered using a hose or drip irrigation.</p> <p>Restaurants shall serve water only upon the request of customers.</p> <p>Hotels encouraged to replace towels and bed linens for new guests and at the request of existing guests.</p>
Level 4 Severe	40 - 50%	Irrigation of all landscape elements is prohibited, including gardens (edible and ornamental).

PAWSD will make every effort and utilizes resources that ensure the public is regularly made aware of the severity of the current drought situation. The steps required to achieve this goal are redundant for levels 2 – 5. Level 1, being voluntary, does not necessitate more costly outreach efforts, such as direct mailings, because there are no mandated water use restriction measures being imposed.

The Public Drought Campaign is to be executed by the District Manager.

**Table 11 – Public Information Campaign Components and Tools**

Public Information Campaign Components	Dissemination Tools							
	Web	Water Bill	Newspaper	Direct Mailing	Radio	Public Meeting	Email	AquaHawk
Status of current water supply and drought conditions	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
Demand reduction goals	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Current drought stage and water use restrictions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Measures/impacts customers can expect if drought continues or	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Explanation of modified rate structure/drought surcharge	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water conservation tips and suggestions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Water reuse education	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Promote xeriscaping	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
Promote efficient irrigation practices	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

## 8. IMPLEMENTATION AND MONITORING

### 8.1. DROUGHT MITIGATION ACTION PLAN

The table below shows current actions and projects that PAWSD is engaged in to increase the security and understanding of the water supply system and provide mitigation of the effects of drought.

**Table 12 – Drought Mitigation Actions, Steps, Milestones, and Administration**

List of Drought Mitigation Actions	Steps to Implementation	Milestone Deadlines	Entities/Staff Responsible for Administration
Water Conservation Plan	follow plan	to be updated 2023	District Manager
UV Disinfection at the San Juan Water Treatment Plant	State approval Financing and Installation	Winter 2018/19	Operation Superintendent/Project Manager
Fourmile Creek stream access	purchase senior water rights	On-going	District Manager
Infrastructure Leak Detection	field time	On-going	Utility Infrastructure Superintendent
Demand side Leak Detections	Utilize AMI system	On-going	Utility Infrastructure Superintendent

## 8.2. MONITORING OF DROUGHT INDICATORS

As described in Section 6.1, the monitoring and recording of the water supply is critical in understanding the dynamics of the water supply as well as in predicting the potential and severity of drought.

Table 13 provides an overview of drought indicators, sources, monitoring frequency and PAWSD staff responsible for these tasks.

**Table 13 – Drought Indicators, Resources, Information Locations, Monitoring, and Administration**

Drought Indicators	Information Resources	Information Locations	Monitoring Frequency	Entities/Staff Responsible for Administration
Snow Water Equivalent (SWE)	NRCS	<a href="http://www.wcc.nrcs.usda.gov">www.wcc.nrcs.usda.gov</a>	October 1 – September 30	District Manager
Precipitation	NRCS	<a href="http://www.wcc.nrcs.usda.gov">www.wcc.nrcs.usda.gov</a>	October 1 – September 30	District Manager
San Juan Stream Flow	USGS	<a href="http://waterdata.usgs.gov">http://waterdata.usgs.gov</a>	October 1 – September 30	Superintendent
Fourmile Creek Stream Flow	Not Available	Not Available	April 1 - November 1	Superintendent
Reservoir Levels	PAWSD Staff	S://Water Plant Production/Historical Lake Levels.xls	Utility Infrastructure Superintendent	Utility System Operator/Superintendent

It is important that knowledge and insights gained through conditions monitoring be cataloged and shared. Beginning April 1 of each year, the District Manager shall begin collecting and recording current water supply conditions, the main components of which are highlighted below.

Table 14 provides an overview of the calendar schedule for drought monitoring tasks for PAWSD staff.

**Table 14 – Conditions Monitoring Schedule**

Conditions Monitoring Schedule	
April	<p>Water Supply Availability Forecast</p> <ul style="list-style-type: none"> <li>• Snowpack (% of average)</li> <li>• Snow Water Equivalent Index</li> <li>• Reservoir levels</li> <li>• San Juan stream flow (% of average)</li> </ul> <p>Use mountain snowpack conditions to begin forming relevant press release</p>
May	<p>Continue Water Supply Availability Monitoring</p> <ul style="list-style-type: none"> <li>• Snowpack (% of average)</li> <li>• Snow Water Equivalent Index</li> <li>• Reservoir levels</li> <li>• San Juan stream flow (% of average)</li> <li>• Fourmile Creek diversions</li> </ul> <p>Use current conditions to promote water conservation Communicate current observed water supply conditions to the Board of Directors Appropriate and timely press releases</p>
June	<p>Continue Water Supply Availability Monitoring</p> <ul style="list-style-type: none"> <li>• Snowpack (% of average)</li> <li>• Snow Water Equivalent Index</li> <li>• Reservoir levels</li> <li>• San Juan stream flow (% of average)</li> <li>• Fourmile Creek diversions</li> </ul> <p>Use current conditions to promote water conservation Communicate current observed water supply conditions to the Board of Directors Begin discussions about potential implementation of the appropriate drought stage based upon Trigger Points Begin efficient irrigation community awareness campaign Continue appropriate and timely press release and radio adds</p>
July	<p>Continue Water Supply Availability Monitoring</p> <ul style="list-style-type: none"> <li>• Reservoir levels</li> <li>• San Juan stream flow (% of average)</li> <li>• Fourmile Creek diversions</li> </ul> <p>Use current conditions to promote water conservation Communicate current observed water supply conditions to the Board of Directors Implementation of appropriate drought stage based upon Trigger Points (if applicable) Continue efficient irrigation community awareness campaign Continue appropriate and timely press release and radio ads</p>
August	<p>Continue with the efforts shown above until such a time as concerns of drought and water supply availability have past</p>

### **8.3. DROUGHT DECLARATIONS**

It is the role of the District Manager, to ensure that the above mentioned drought indicators are monitored and formally recorded beginning April 1 and concluding November 1 of each year.

A worksheet has been developed that allows PAWSD staff to enter current reservoir levels and water inflow from the Fourmile Creek and San Juan River diversions as well as estimated demand through the water year. With these data sets in place the worksheet will calculate the amount of water available and will prompt the user when a trigger point threshold has been crossed.

Once a trigger point threshold has been crossed, the District Manager will present these findings to the PAWSD Board of Directors.

Voluntary measures can be implemented by the District Manager however it is the responsibility of the PAWSD Board of Directors to formally declare a drought thereby allowing the District to begin efforts to reduce water demand through the use of the surcharge and/or tier rate multipliers. This announcement should be made at the next scheduled public Board meeting. A special meeting may be called should the current situation warrant such immediacy.

### **8.4. IMPLEMENTATION OF THE STAGED DROUGHT RESPONSE PLAN**

The District Manager is responsible for recommending to the Board of Directors the current drought status and any accompanying water use restrictions. The final determination of the Board of Directors will be made public by utilizing the local media outlets, direct customer mailing and statement inserts and use of the AquaHawk system when applicable. It is the role of the District Manager to implement the staged drought response plan. Once the elements of the Plan are put into motion following a formal determination by the Board of Directors of the current drought level, an “all hands on deck” approach is to be employed by all PAWSD staff wherein each staff member will have a role in implementing the Plan. Administrative and field staff will be briefed on the current situation and how their responsibilities and duties may be modified to achieve the demand reduction goal stated within each level of drought severity. At the outset of each drought stage, the District Manager shall provide PAWSD staff with a handout detailing the current drought stage and the water use restrictions therein so as to ensure everyone understands the details and all public communication is accurate and consistent.

### **8.5. ENFORCEMENT OF THE STAGED DROUGHT RESPONSE PLAN**

PAWSD customers will be made aware of the current drought situation and any corresponding mandatory water use restrictions as described in Section 7.0. Repeated failure to comply with mandatory watering restrictions and/or watering days could result in PAWSD imposing penalties as specified in the District’s Rules and Regulations. These violation charges will be added to the property

owner’s monthly water bill and if not paid in a timely manner, could result in the disconnection of service.

With each violation, it is the duty of the Customer Accounts Supervisor to notify the property owner in writing of the violation, the date of the occurrence, as well as any resulting fine. All notifications will be sent to the address on record.

**Table 15 – Non-Compliance**

Non-Compliance Violations	Level 1	Level 2
	Voluntary	Low to Severe
First	Not Applicable	Written warning and Water Conservation Level Notification Sheet delivered.
Second	Not Applicable	\$100 fine, Water Conservation Level notification sheet delivered.
Third	Not Applicable	\$250 fine Water Conservation Level Notification Sheet delivered.
Fourth	Not Applicable	\$500 fine Water Conservation Level Notification Sheet delivered.

NOTE: The fees for non-compliance are subject to change.

## 8.6. REVENUE IMPLICATIONS AND FINANCIAL BUDGETING PLAN

It is commonly understood that a reduction in water demand is generally followed by a reduction in revenue. It is also true that there is a relationship between price and demand in that as the price increases, the demand generally decreases. In light of this, PAWSD may impose a drought surcharge or modified rate structure to accomplish two things –

1. Reduce water demand.
2. Ensure financial stability during times of decreased water deliveries.

It is PAWSD’s goal to avoid undue hardship or unfair restrictions upon those already working to conserve water. For this reason each residential water customer will be allowed up to 4,000 gallons per month (per EU) free of additional tier rate increases related to drought (surcharge will apply). Commercial water users will be allowed up to 6,000 gallons per month (per EU) free of tier rate increases related to drought (surcharge will apply). A customer who uses in excess of within a billing period will be subject to structured water rate increases as detailed below.

**Table 16 – Drought Surcharge/Water Rate Adjustment (Residential)**

Gallons/EU	Voluntary	Level 1	Level 2	Level 3	Level 4
0 - 4000	n/a	surcharge only	surcharge	surcharge	surcharge
4,001 +	n/a	surcharge only	surcharge and 2x standard tier rate fee	surcharge and 3x standard tier rate fee	surcharge and 4x standard rate fee

**Table 17 – Drought Surcharge/Water Rate Adjustment (Commercial)**

Gallons/EU	Voluntary	Level 1	Level 2	Level 3	Level 4
0 - 6,000	n/a	surcharge only	surcharge	surcharge	surcharge
6,001 +	n/a	surcharge only	surcharge and 2x standard tier rate fee	surcharge and 3x standard rate fee	surcharge and 4x standard rate fee

Financial incentive for water conservation

Voluntary: Standard rate structure applies. No surcharge will be added.

Level 1 - Low: Standard rate structure applies with the addition of a drought surcharge.

Level 2 - Moderate: The standard rate structure will be applied per 1,000 gallons of use up to 4,000 gallons (per EU) for residential and up to 6,000 gallons (per EU) for commercial or non-residential. Two times the standard rate structure will apply to gallons used over 4,000 gallons (per EU) residential or 6,000 gallons (per EU) commercial or non-residential. The drought surcharge remains in place under the same structure as Level 2.

Level 3 - Serious: Three times the standard rate structure will apply to the gallons used in excess of 4,000 (per EU) residential or 6,000 (per EU) commercial or non-residential within a single billing period. The Drought Surcharge remains in place under the same structure as Level Two.

Level 4 - Severe: Four times the standard rate structure will apply to the gallons used in excess of 4,000 (per EU) residential or 6,000 (per EU) commercial or non-residential within a single billing period. The Drought Surcharge remains in place under the same structure as Level Two.



Businesses wherein the control of water use is not regulated by the owner (i.e., Hotels, Car Washes, etc.) may appeal to PAWSD for a reduction or waiver of drought surcharge increases so long as the business can show that it is doing everything within its power to encourage water conservation at all levels.

The funding to implement, monitor, and manage the numerous components of the Drought Management Plan will come from the PAWSD general fund for operations. It is not anticipated that revenue shortfalls due to the effectiveness of community water demand reductions during a time of drought should ever result in permanent water rate increases.

### **8.7. MONITORING OF PLAN EFFECTIVENESS**

Should the Drought Management Plan be employed in a time of water scarcity, the overall effectiveness of the Plan will be gauged by whether or not the demand reduction goals were achieved. This will be determined by comparing the most current monthly water sold amount to historic averages from the same month. The public outreach and clear and timely messaging are the key components to ensure community support. PAWSD is committed to ensuring that all customers will be well informed of the drought stage, the accompanying water use restrictions, the demand reduction goal, and why these steps are necessary.

Under the direction of the Special Projects Manager, following a drought event where water use restrictions were mandated, PAWSD will host a public forum to solicit comments so as to gauge the perception of the overall effectiveness of the plan and the way in which it was employed. Community feedback from this meeting will be used to strengthen the Plan.

## **9. FORMAL PLAN APPROVAL AND UPDATES**

### **9.1. PUBLIC REVIEW PROCESS**

A formal public review process was held to highlight elements of the Plan and solicit community feedback on the Plan on May 1, 2018. Public comments were collected via email, written statements, and at the public hearing through May 17, 2018.

The draft Drought Management Plan was available to the public from the PAWSD website ([www.pawsd.org](http://www.pawsd.org)), PAWSD office and at the public hearing.

### **9.2. ADOPTION OF RESOLUTION AND OFFICIAL AGREEMENTS**

It is the sole responsibility of the PAWSD Board of Directors to declare a drought wherein the elements of the Drought Management Plan will begin to take effect.

### **9.3. DROUGHT MANAGEMENT PLAN APPROVAL**

The PAWSD 2018 Drought Management Plan was approved by the Board of Directors on May 17, 2018.

### **9.4. PERIODIC REVIEW AND UPDATE**

This Plan is scheduled to be revisited and updated every five years with the next revision to occur in 2023. Should a drought event occur and elements of the Plan put into place, an update would follow based upon the monitoring objectives laid out in Section 8.7.

## **10. CURRENT PRECIPITATION DATA**

At the time of this writing, May 2018, Archuleta County was going through a very dry water year with a snowpack of approximately 52% of average. Graphs are provided in the appendices displaying the limited precipitation received during the 2018 winter. Data provided in these graphs is from the USGS SnoTel Site Number 840 Upper San Juan which began collecting data in 1981.

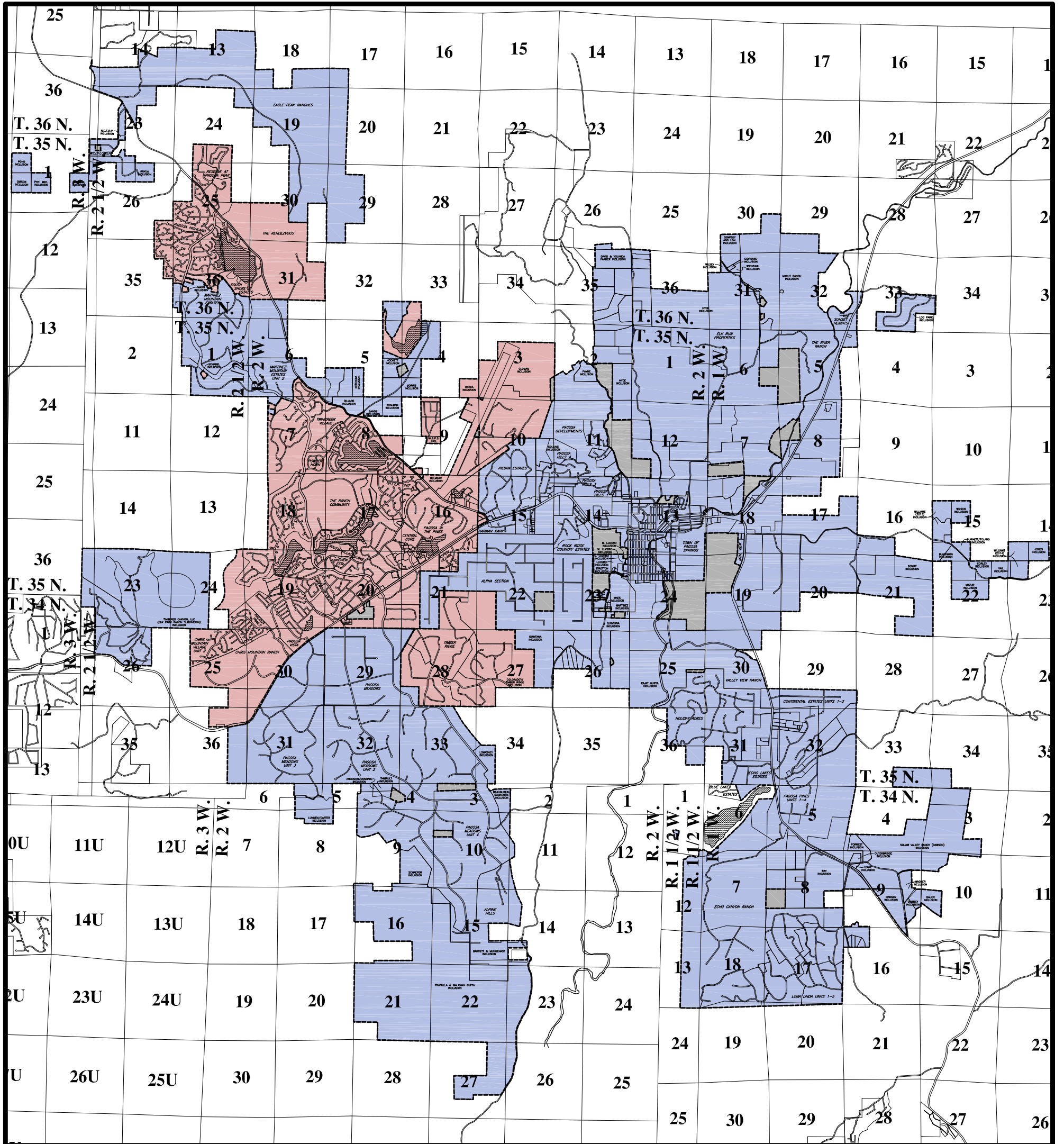
The first graph is a Cumulative Precipitation graph comparing the average precipitation with precipitation from 2018 to date; water year 2017 and the 2002 drought. The federal water year runs from October 1<sup>st</sup> through September 30<sup>th</sup>.

The second graph is a snow water equivalent graph showing the amount of water stored in the snowpack. The graph is comparing the median snow water equivalent with the 2018, 2017 and 2002 water years.

2002 is included in both graphs because that is the last year in which a drought caused the district to implement mandatory water conservation procedures.

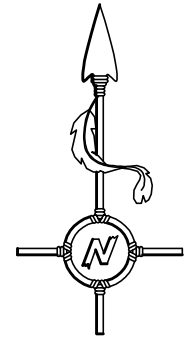
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## **APPENDIX**



YEAR ADDED	INCLUSION NAME	EQUIVALENT UNITS	YEAR ADDED	INCLUSION NAME	EQUIVALENT UNITS	YEAR ADDED	INCLUSION NAME	EQUIVALENT UNITS	YEAR ADDED	INCLUSION NAME	EQUIVALENT UNITS
1994	Beaugureau & MacKenzie	25	1997	Ray	6	1999	Maes	1	2007	Thibault (Portion Lot 266X Meadows 4)	0
	Echo Canyon Ranch	2		Wagner	3		Macht Ranch	2		Maun (Wastewater Lot 57 Mtz. Mtn.)	1
	Cloman	20		Dillard	3		Timbered Canyon, LLC (Elk Park)	119		Humane Soc. of P.S. (2 add. W & WW)	2
	Collins	2		Downey	1		David and Yolanda Parker	4			
	Dempsey & Leal	2		Bauer	1	2002	Lunnen/Carter (Hidden Meadows)	5	2010	Cecka Family Living Trust	1
	Eagle Peak Ranches	12		Wildflower Sub. (ex. lots 27, 35, 42-45)	45		Atkinson/Danharl	0	2012	N.C.F.R.P., Inc. (Wildflower, Lot 45)	1
	Giordano	1		Kukla	1		Wienpahl	1	2013	Blackman	1
	P. & M. Gupta	2		The River Ranch (S.J.R.E., LLC)	8		Hansen	0		Mazur	1
	R. Gupta	13		Lucero	1	2003	Lomasney	1		Corley	1
	Hyde	19		Stretton	1		Payne	1		Soniati	1
	Quintana	10		Frazier (Valley View Ranch, Tr. 1)	1		Morris	1		Williams	2
	Wilsey	1		Victory Mgmt. (Valley View Ranch, Tr. 2)	2					Wilson	1
1995	Martinez	1		Clare (Valley View Ranch, Tr. 3)	1	2004	Humane Society of Pagosa Springs	2	2014	Vail	1
	Sands	1		Frazier (Valley View Ranch, Tr. 4)	1		Hockett	1		Jones	1
1996	Alpine Hills Subdivision	12		Brown (Valley View Ranch, Tr. 5)	2	2005	Jimmy Lucero	2		Williams	1
	Dawson	23		Pond	1		Bernardo Lucero	1	2016	Schabel (Wastewater Mtz. Mtn. 2, Lot 1)	1
	Forrest	4		Gibson	1		Madaline Lucero	2			
	Leake	2		Phy. Med. (Barker)	1	2006	Dillard (Wastewater for 2 lot subdivision)	2			
	Maez	3	1998	Thalman	2		Knudson (Wastewater Lot 59 Mtz. Mtn.)	1			
	Outerbridge	1		Ketchum	2						
	Schoeper	2		Colorado's Timber Ridge (Machock)	260						
				Belmeor	14						

**P.A.W.S.D.**  
 PAGOSA AREA WATER AND SANITATION DISTRICT



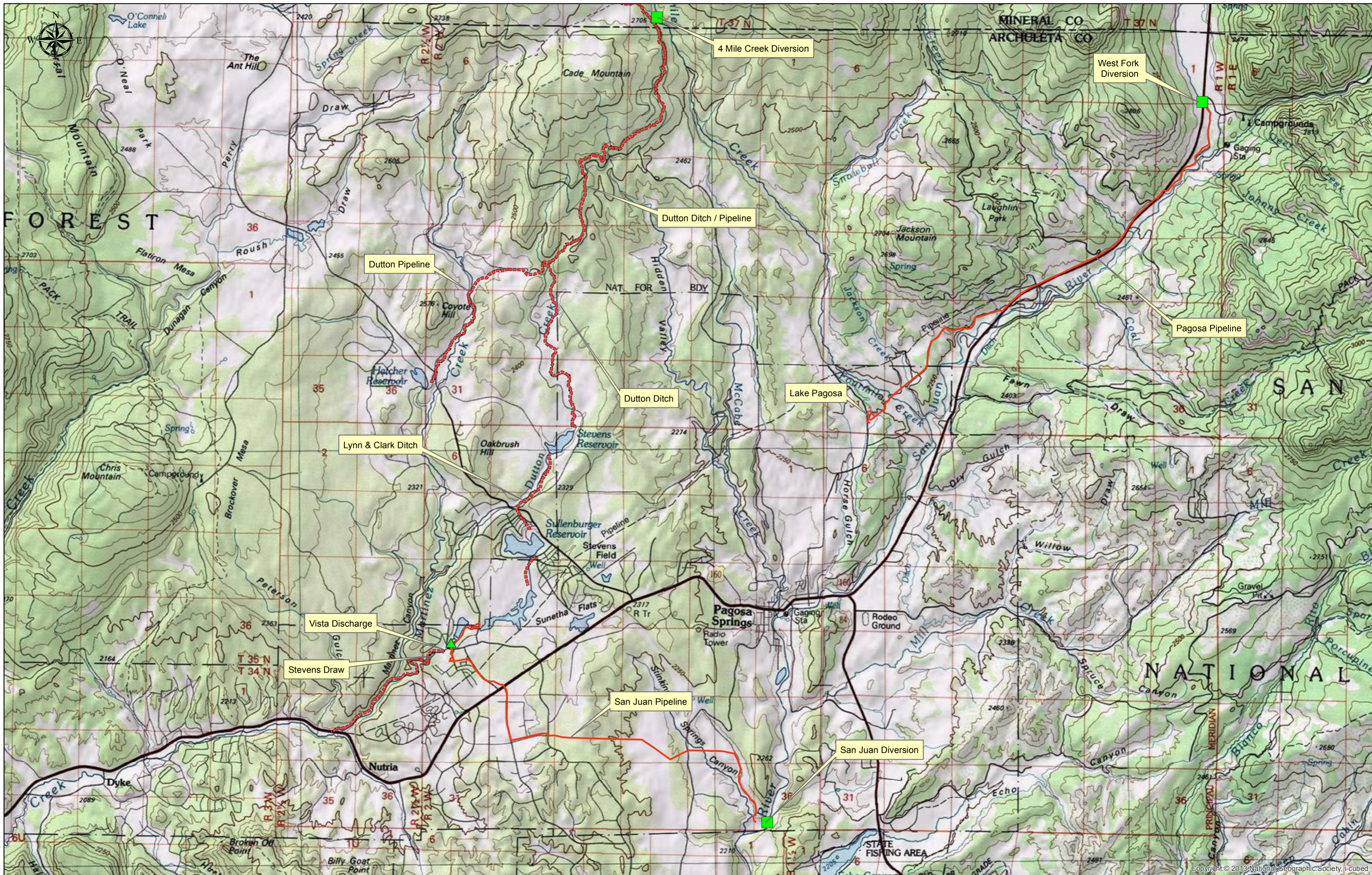
- INCLUDED IN DISTRICT WATER AND SEWER SERVICE
- INCLUDED IN DISTRICT WATER SERVICE ONLY
- EXCLUDED FROM DISTRICT

MAP OF  
 PAGOSA AREA WATER AND SANITATION DISTRICT  
 ARCHULETA COUNTY, COLORADO

PREPARED BY  
 DAVIS ENGINEERING SERVICE, INC.  
 188 S. 8th STREET - P.O. BOX 1208  
 PAGOSA SPRINGS, COLORADO 81147

REVISED OCTOBER 27, 2016

ORIGINAL SCALE: 1" = 7000'  
 0' 7000'



4 Mile Creek Diversion

West Fork Diversion

Dutton Ditch / Pipeline

Dutton Pipeline

Pagosa Pipeline

Dutton Ditch

Lake Pagosa

Lynn & Clark Ditch

Vista Discharge

Stevens Draw

San Juan Pipeline

San Juan Diversion

Appendix C - PAWSD Raw and Potable Water Production 2008 - 2017

**2008**

WTP	Gallons	Acre Feet
Hatcher	395,165,000	1212.72
San Juan	43,457,000	133.36
Snowball	235,852,000	723.80
TOTAL:	674,474,000	2,069.88

**2013**

WTP	Gallons	Acre Feet
Hatcher	274,165,000	841.38
San Juan	116,691,000	358.11
Snowball	299,427,000	918.91
TOTAL:	690,283,000	2,118.40

**2009**

WTP	Gallons	Acre Feet
Hatcher	305,316,000	936.98
San Juan	45,352,000	139.18
Snowball	256,932,000	788.50
TOTAL:	607,600,000	1,864.66

**2014**

WTP	Gallons	Acre Feet
Hatcher	366,365,000	1124.33
San Juan	0	0.00
Snowball	164,617,000	505.19
TOTAL:	530,982,000	1,629.52

**2010**

WTP	Gallons	Acre Feet
Hatcher	321,794,000	987.55
San Juan	52,538,000	161.23
Snowball	10,042,000	30.82
TOTAL:	384,374,000	1,179.60

**2015**

WTP	Gallons	Acre Feet
Hatcher	368,003,000	1129.36
San Juan	0	0.00
Snowball	185,784,000	570.15
TOTAL:	553,787,000	1,699.51

**2011**

WTP	Gallons	Acre Feet
Hatcher	362,554,000	1112.64
San Juan	31,526,000	96.75
Snowball	153,945,000	472.44
TOTAL:	548,025,000	1,681.83

**2016**

WTP	Gallons	Acre Feet
Hatcher	390,716,000	1199.06
San Juan	0	0.00
Snowball	185,572,000	569.50
TOTAL:	576,288,000	1,768.56

**2012**

WTP	Gallons	Acre Feet
Hatcher	251,998,000	773.35
San Juan	6,838,000	20.99
Snowball	160,822,000	493.54
TOTAL:	419,658,000	1,287.88

**2017**

WTP	Gallons	Acre Feet
Hatcher	409,853,000	1257.79
San Juan	15,021,000	46.10
Snowball	211,897,000	650.29
TOTAL:	636,771,000	1,954.18

Appendix C - PAWSD Raw and Potable Water Production 2008 - 2017

2008 - 2017	AF
WTP Production	17,254.03
Raw Water	5,206.04
Total Acre Feet	22,460.07
Average/Year	2,246.01

**2008 - 2017**

Production	AF	Ave
Hatcher	10,575	1,057.52
San Juan	956	95.57
Snowball	5,723	572.31
TOTAL:	17,254	1,725.40

Area	Ave (AF)
Uptown (Dist. 1)	1,153.09
Downtown (Dist 2)	572.31
Sub-Total	1,725.40
Raw Water	520.60
Tot Ave Wtr	2,246.01

## Appendix D – 2018 Firm Yield Report

### Existing Capacity Operation

		Ave/AF	Summer/MGD
Water Production			
	Treated	1,7254.4	4.6
	Raw	520.6	4.2
	TOTAL	2,246.0	8.9
Usable Storage			
	Hatcher	880.0	880.0
	Stevens	1,730.0	1,730.0
	Pagosa	920.0	920.0
	Village	228.0	228.0
	Forest	269.0	269.0
	TOTAL	4,027.0	4,027.0
Diversions			Summer/MGD
	West Fork	7,241.1	6.5
	Main Stem	12,141.2	10.8
	Four Mile	6,338.4	0.0
	TOTAL	25,720.6	17.3

Note:

1. Summer flows are typically 3 X average flows.
2. Based upon the average amount of water produced at the Water Treatment Plants from 2008-2017.

1. Snowball pipeline and treatment plant are used to supply the District area from Putt Hill through town and down Highway 84 to Loma Linda. During the drought of 2002 the supply provided to the treatment plant from the West Fork Diversion was approximately 720 AF. The demand in this area is approximately 573 AF so there is adequate supply for current demand. It is assumed that no water from the Hatcher or San Juan WTP is necessary to meet this areas demand.

2. Pagosa Lakes area facilities are operated to:

- a. Fourmile Creek flow is diverted into the Dutton Ditch Pipeline whenever in priority. During the winter much of the Fourmile creek flow is contained in snow and ice, in the summer months a call on the river by senior water right holders stops all diversions into the Dutton Pipeline. Thus PAWSD has access to average flows in the Dutton Ditch of approximately 1.5 cfs for an average of seven months per year

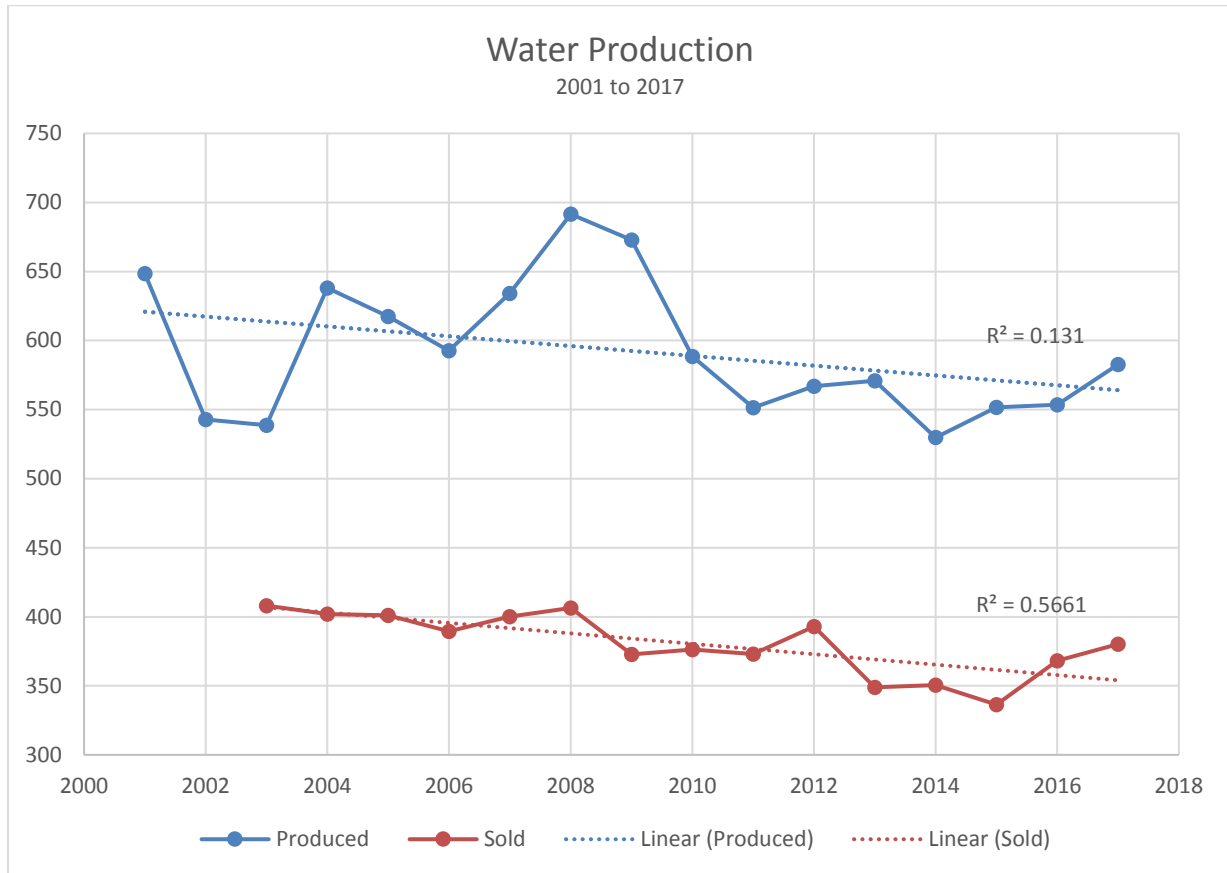


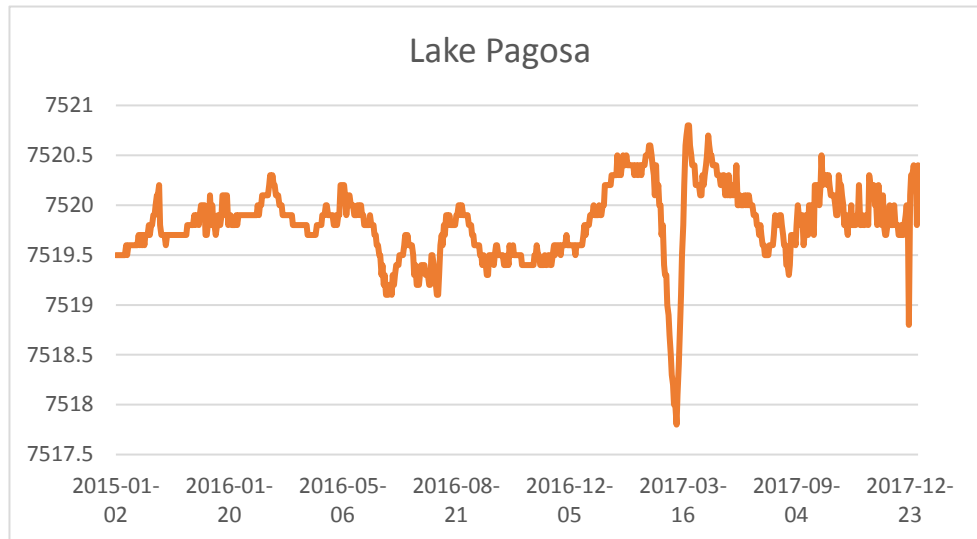
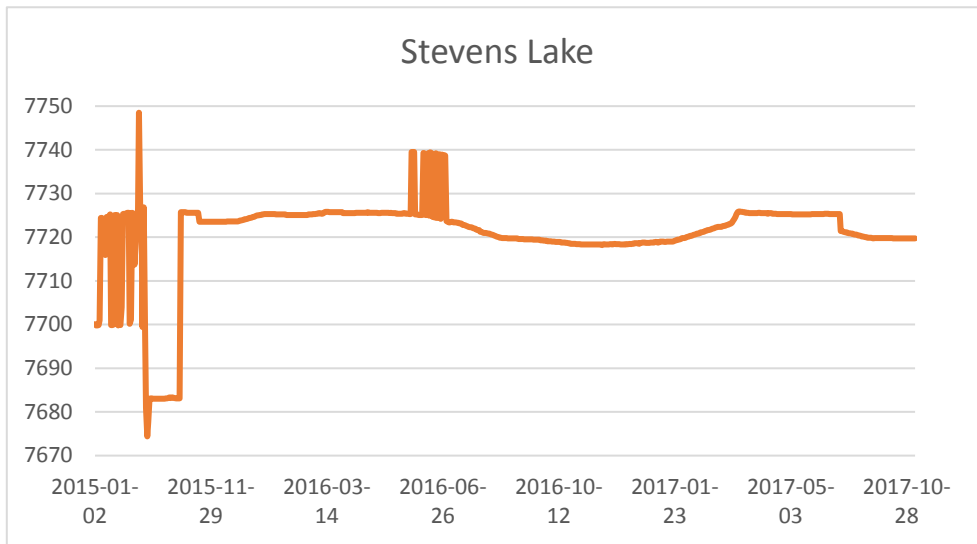
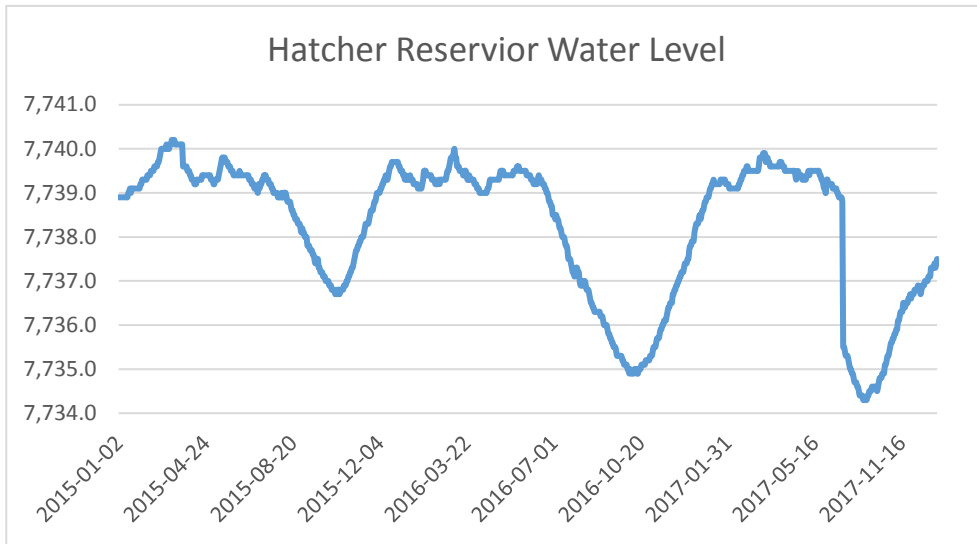
- b. Flows in the Dutton Pipeline are first delivered to Hatcher Reservoir. Once Hatcher is full the flows can be totally or partially diverted to Stevens Reservoir.
- c. Hatcher Reservoir and treatment plant are used first to meet demands, then if the demand exceeds the treatment plant capacity or the reservoir is low, then San Juan treatment plant can treat water from Lake Forest or the San Juan Diversion and pump station can move San Juan water to Village Lake, Lake Forest or directly to the treatment plant. Note, at the time of this report PAWSD is legally unable to pump water from the San Juan diversion directly to the San Juan Plant. A UV disinfection system is currently under review by the Colorado Department of Public Health and Environment, upon approval and installation direct discharge to the San Juan Plant will be able to resume.
- d. The San Juan Water Treatment Plant can operate year round but cost constraints minimize the use of the plant for peaking only.
- e. In addition to flows from the San Juan Diversion as described above, Lake Forest is also fed from the chain of upstream reservoirs of Village Lake, Lake Pagosa and Stevens Reservoir.
- f. The water rights at the San Juan diversion are complicated but generally are:
  - a. A 6.5 cfs senior water right but the decree limits PAWSD to 105 AF per year.
  - b. A 0.8 cfs conditional right. The 0.8 priority date is equal to a competing Alpine Cascade water right located about one mile downstream.
  - c. A 12.0 cfs conditional fill right. This right is for storage in the river intake Forebay, Lake Forest, Village Lake, Pinon Lake, Lake Pagosa, Martinez Dam, Stevens Reservoir and Hatcher Reservoir. Currently this right can only be conveyed to Lake Forest and Village Lake. This right is decreed for municipal and other purposes.
  - d. A 12.0 cfs conditional fill right. This right is for storage in the river intake Forebay, Lake Forest, Village Lake, Pinon Lake, Lake Pagosa, Martinez Dam, Stevens Reservoir and Hatcher Reservoir. Currently this right can only be conveyed to Lake Forest and Village Lake. This right is decreed for recreational purposes.
  - e. A 1.52 cfs senior water right.
  - f. A 15.06 cfs conditional right.
  - g. Current pumping limitations allow for approximately 4 cfs.
- g. PAWSD is contracted to provide the Golf Course with an annual guarantee of 300 acre feet of water.
- h. Reservoir evaporation is not included in this report.

The current facilities and water supplies are adequate to provide the current demand during a foreseeable drought with no shortages and water remaining in storage at the worst point of the drought. Based on the numbers provided above there is approximately 2.2 years of storage for water needs including raw water sales. This storage assumes there will be adequate diversions from West Fork to meet all downtown water needs.

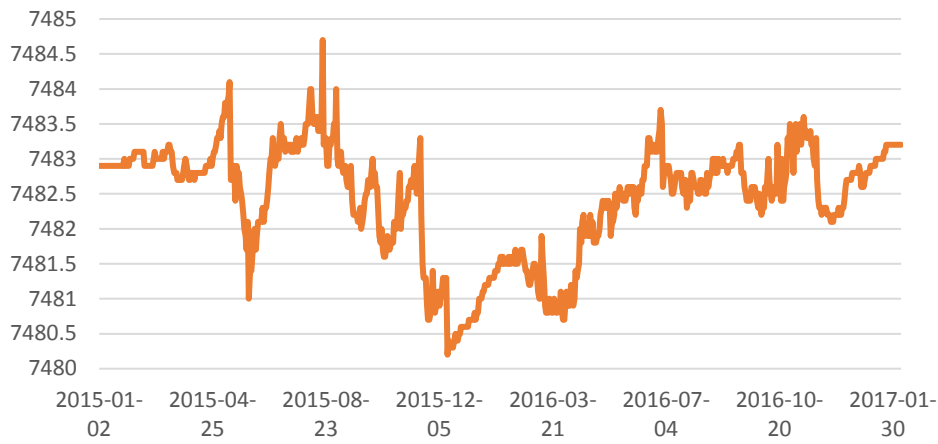
It should be noted that as water levels in reservoirs drop the quality of the water drops. This decrease in water quality impacts the efficiency of treatment facilities, reducing the actual treated volume from the treatment plants as well as increasing the cost per gallon. There is also an esthetic degradation as lake levels drop with lake shore receding from surrounding residences and existing boat docks and public access points.

Water demand throughout the district had been decreasing from 2008 to 2015. As of 2015 water production and use has been increasing but has not reached 2008 levels. The decrease in water use was due in large part due to voluntary water conservation by PAWSD clients.

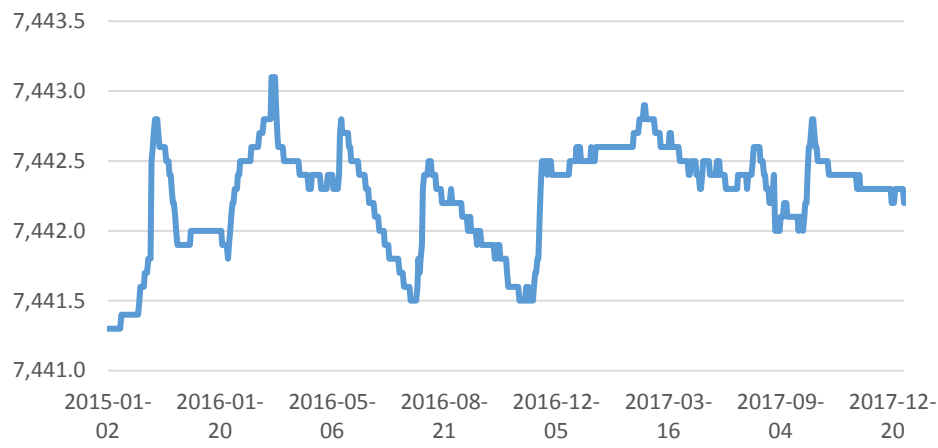




### Village Lake



### Lake Forest Level



Jim Smith, President/Chairman  
Blake Brueckner, Vice President  
Gordon Mclver, Secretary



Paul Hansen, Treasurer  
Glenn Walsh, Director

## PRESS RELEASE

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Due to current drought conditions and decreasing water supply levels, the Pagosa Area Water and Sanitation District (PAWSD) will begin implementation of Level \_\_\_ water use restrictions beginning \_\_\_\_\_.

Below is an abridged summary of the levels of water use restrictions. A full and detailed explanation of forthcoming water use restrictions will be mailed to all PAWSD customers. It is expected that all affected customers will become familiar with the requirements and employ the demand reduction mandates so as to preserve the current water supply. Copies of the PAWSD Drought Management Plan are available at the [www.pawsd.org](http://www.pawsd.org) or at the PAWSD office located at 100 Lyn Avenue.

Level 1 – Voluntary – Drought conditions are such that PAWSD is encouraging customers to voluntarily reduce the amount of water they use. There are no mandatory water use restrictions in place.

Level 2 – Low – Irrigation of landscapes may occur only from 9 pm to 9 am. Restaurants will serve water to customers only when requested. Hotels should only change bedding and wash towels during client turnover or upon request. Acts of water wastefulness are discouraged. Standard rate structure will not be modified. The addition of a drought surcharge of \$7.68 per equivalent unit (EU) shall be applied.

Level 3 – Moderate – Includes all the water conservation measures found in Level Two with some modifications. Irrigation of landscapes will be restricted to 2x per week from 9 pm to 9 am with days selected based upon address. Water waste is prohibited and could result in a fine. The standard rate structure will increase by 2x for residential flows over 4,000 and commercial flows over 6,000 gallons with the surcharge remaining in place.

Level 4 – Serious – Includes all of the water conservation measures found in Level Three with some modifications. Irrigation of trees, shrubs, vegetables, and flowers will be restricted to 1x per week from 9 pm to 9 am with days selected based upon address. Watering of turf, lawns or sod is prohibited. Water waste is prohibited and could result in a fine. The standard rate structure will increase by 3x for residential flows over 4,000 and commercial flows over 6,000 gallons with the surcharge remaining in place..

Level 5 – Severe – This is the most critical stage and includes all of the water conservation measures found in Level Four with some modifications. Watering of landscapes which include trees, shrubs, vegetables, flowers, turf, lawn and sod is strictly prohibited. All non-essential uses of water is prohibited (i.e. car washing) except in cases of health and safety. The standard rate structure will increase by 2x for residential flows over 4,000 and commercial flows over 6,000 gallons with the surcharge remaining in place.

100 Lyn Avenue  
P.O. Box 4610

[www.pawsd.org](http://www.pawsd.org)  
Pagosa springs, Colorado 81157

(970) 731-2691  
FAX (970) 731-2693

## PAGOSA AREA WATER AND SANITATION DISTRICT

### Explanation of LEVEL Two drought state water use restrictions

The current drought situation has placed a strain of the water supply.

It is the goal of the District to reduce community water consumption by 20% so as to extend the usability of the existing water supply.

The following water use restrictions are mandatory.

Watering Days: Irrigation of lawns, trees, shrubs, vegetables and flowers will be restricted to between the hours of 9:00 pm and 8:00 am. Watering days are determined by property address. Addresses ending in even numbers are allowed to water on even number calendar dates. Addresses ending in odd numbers are allowed to water on odd number calendar dates. For example: a property owner with an address on number 242 Water Ave. would be assigned water days such as May 2, 4, 6 and could water in the early morning hours until 8:00 am and/or after 9:00 pm that evening. The intent of these watering hours is to allow flexibility for customers who work either late or early in the day. Likewise an odd numbered address could water either in the morning or evening hours on the odd calendar dates.

#### Water Use Reduction Measures

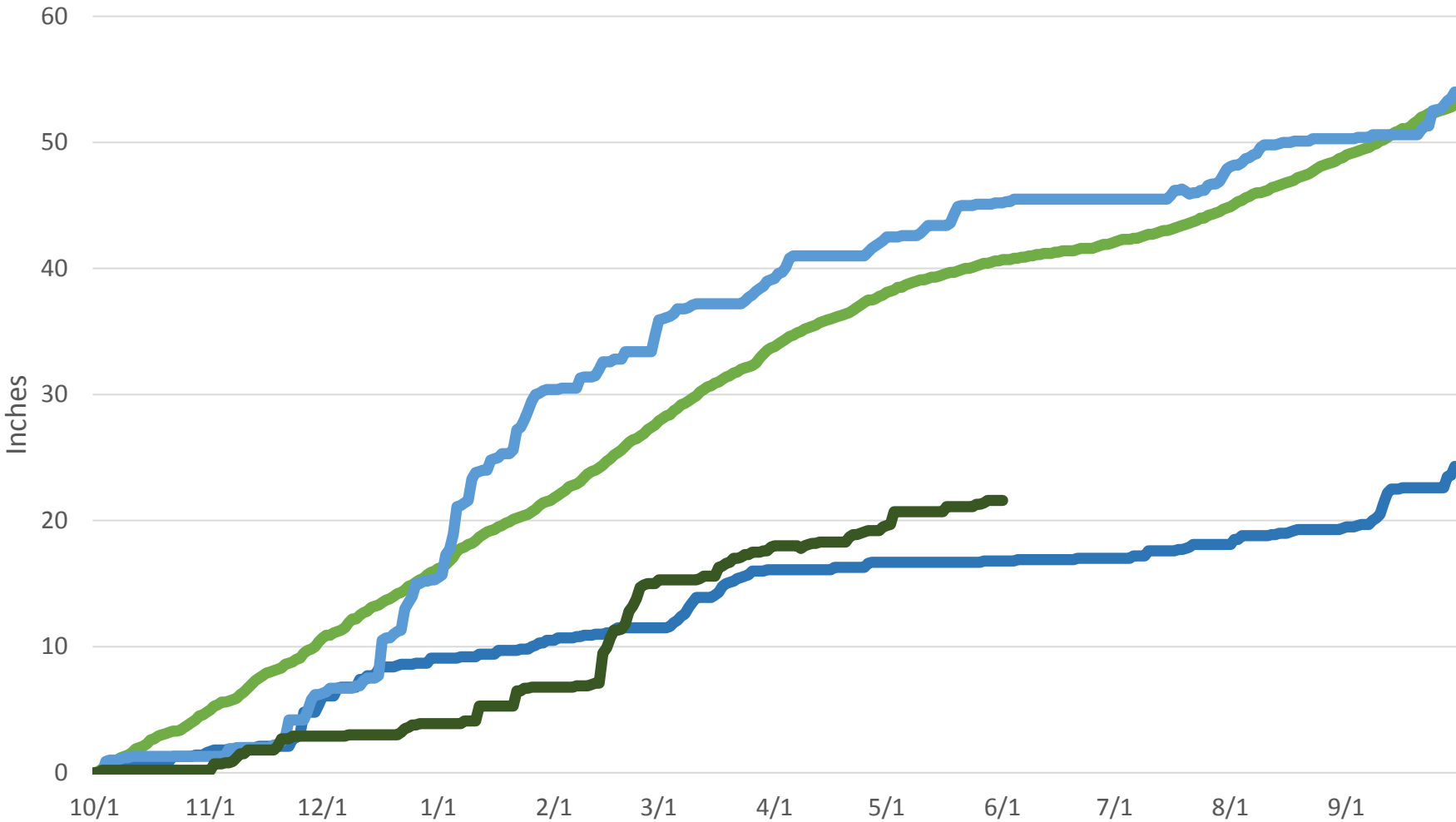
- Continue all measures initiated in the Voluntary Water Conservation Level.
- No watering between the daylight hours of 8:00 am and 9:00 pm on any day including watering days.
- Gardens (both edible and ornamental) may be watered with a hand-held hose or low-volume non-spray irrigation on any day.
- Restaurants are encouraged to serve water only at the request of customers.
- Hotels are encouraged to only change bed linens and towels during client turnover or upon client request.

\$\$\$: Standard rate structure applies with the possible addition of a Drought Surcharge per 1,000 gallons of use over 8,000 and up to 20,000 gallons of water per equivalent unit. The Drought Surcharge is increased per 1,000 for use over 20,000 gallons of water per equivalent unit.

Thank you for your understanding and cooperation.

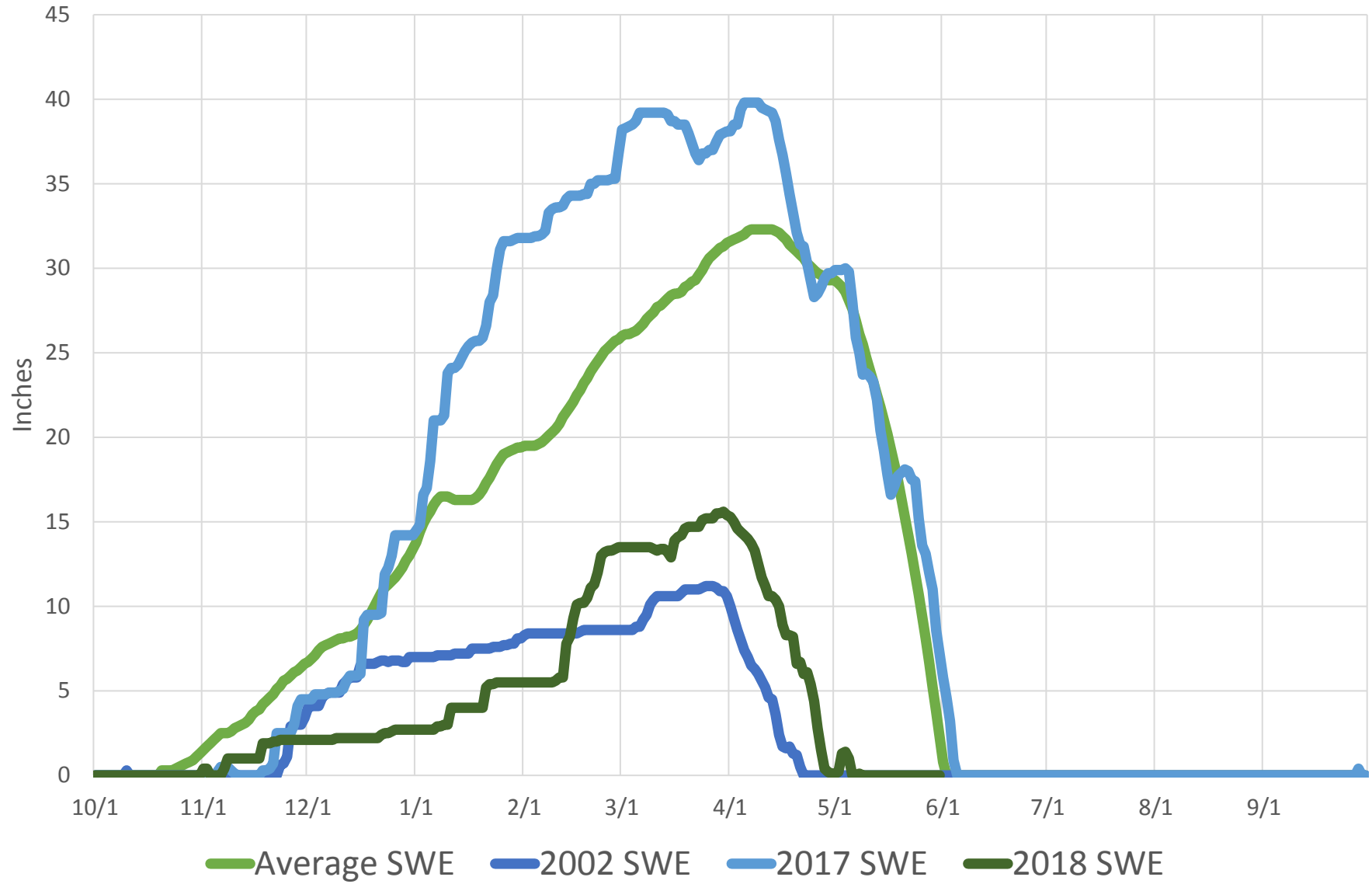


# PRECIPITATION



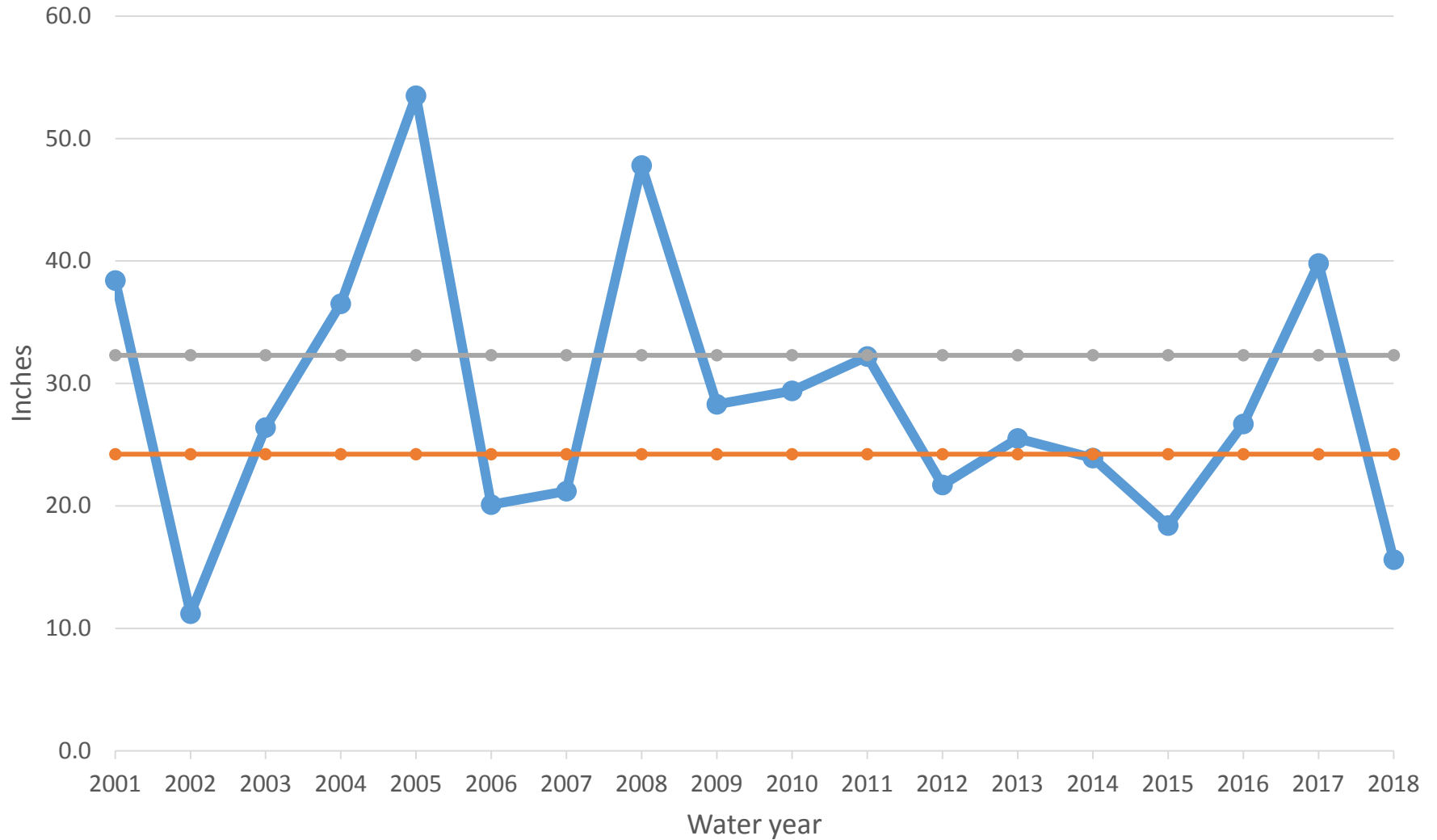
— Ave Precipitation      — 2002 Precipitation  
— 2017 Precipitation Data      — 2018 Preipitation Data

# SNOW WATER EQUIVALENT



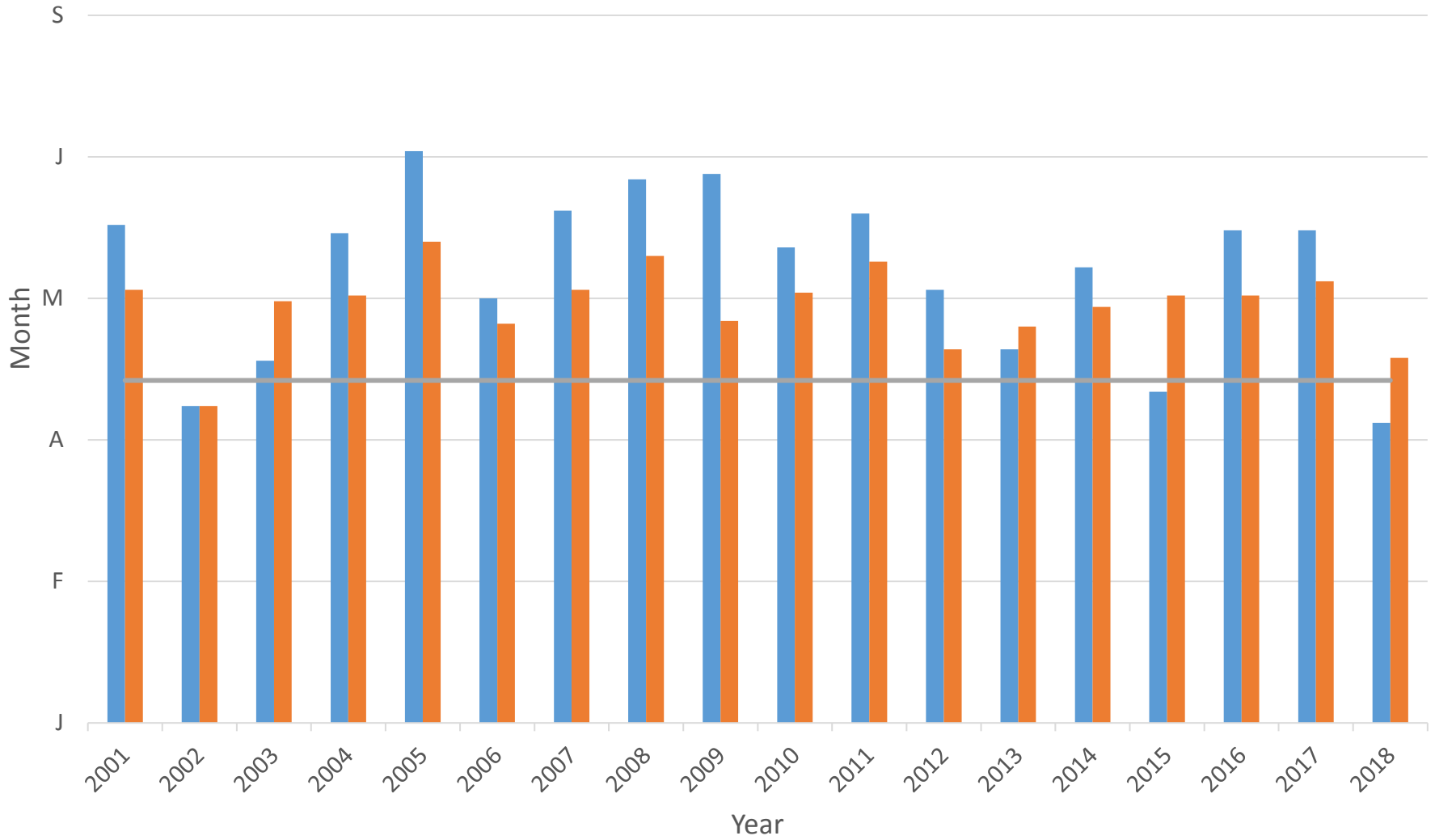


# SNOW WATER EQUIVALENCY TRIGGERS



● Snow Water Equivalent    ● 75% of Median    ● Median

# FOUR MILE CREEK CALL



■ Four Mile Creek Call

■ SWE Reached 0"

— Trigger Point (May 1)