

# Unfiltered Drinking Water Systems in Oregon: Resilience to Climate Change

*How can we make water systems more resilient to climate change?*

## Why Unfiltered?

- Filtered water systems filter out anything that gets into water
- Some of the biggest drinking water systems in the country – New York, Boston, San Francisco, Seattle and **Portland** are unfiltered
- Unfiltered systems may be less resilient to Climate Change because they can't remove sediment and bacteria that gets washed in during heavy rainfall events

## Methods:

1. Identify water quality risks in each watershed based on Source Water Assessment Reports
2. Graph correlations between water quality and weather parameters in the three water sources
3. Hydrologic analysis on cryptosporidium findings in Bull Run in Jan 2017
4. Cost analysis of filtration affordability in the 3 unfiltered water systems, using Bend as an example

## 2017 Cryptosporidium Findings in Bull Run: A case study in Portland

- On January 2nd, 2017, Portland detected traces of cryptosporidium in the water supply for the first period since they began monitoring 5 years ago
- The Portland area had record breaking levels of rainfall this December, with high levels of rainfall proceeding the crypto findings
- When the relatively small storm began on December 28<sup>th</sup>, the **antecedent moisture was 4.8 inches**, leading to a **.03 in/hour infiltration rate**, relatively low for a forested watershed
- The outcome? **More surface runoff!**
- With climate change, we could expect saturated soil conditions, like the ones in December, more frequently

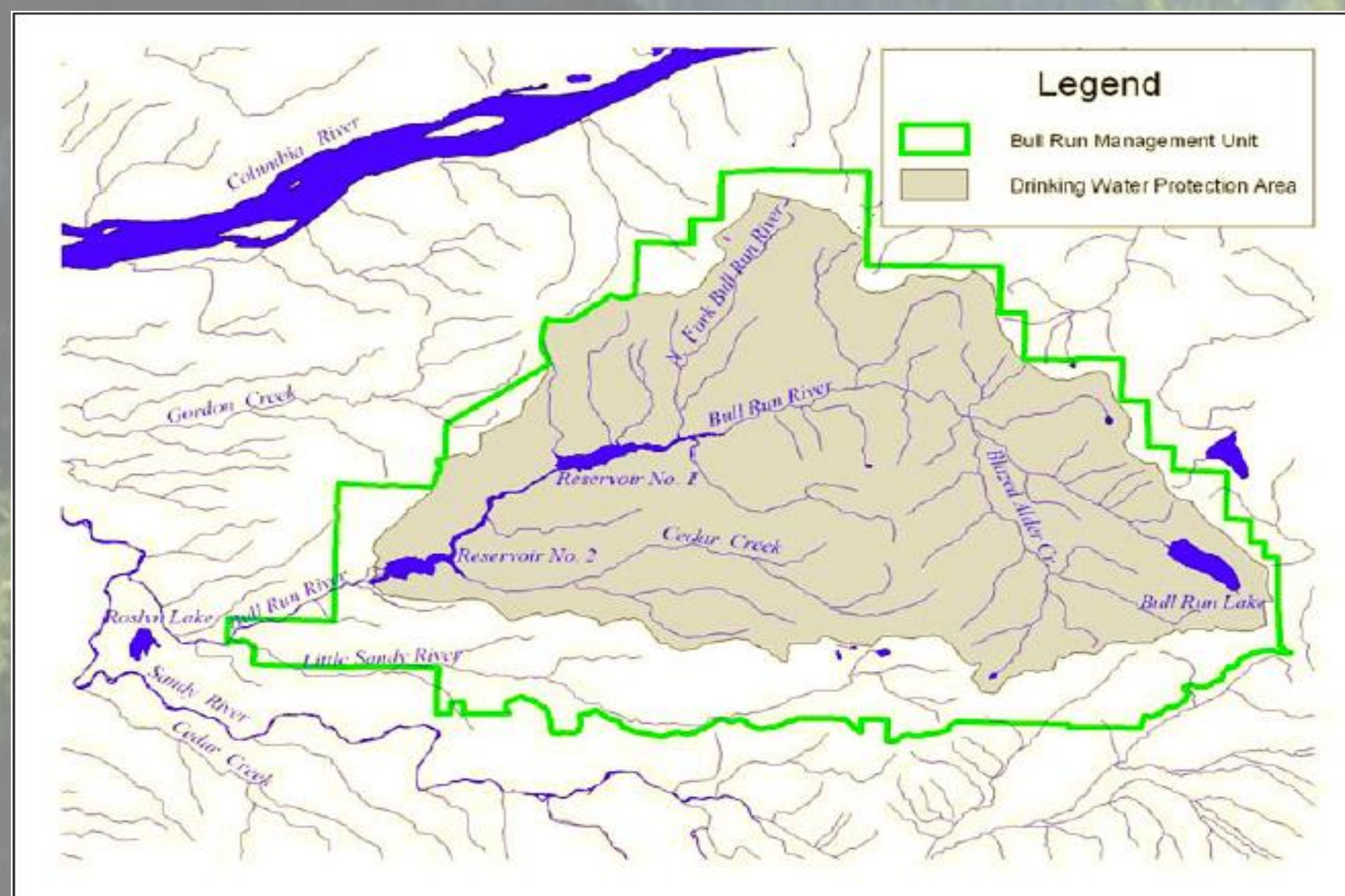


Figure 1. Map from the Portland Water Bureau's source water assessment, outlining the source water protection area (no points of possible contamination were identified).

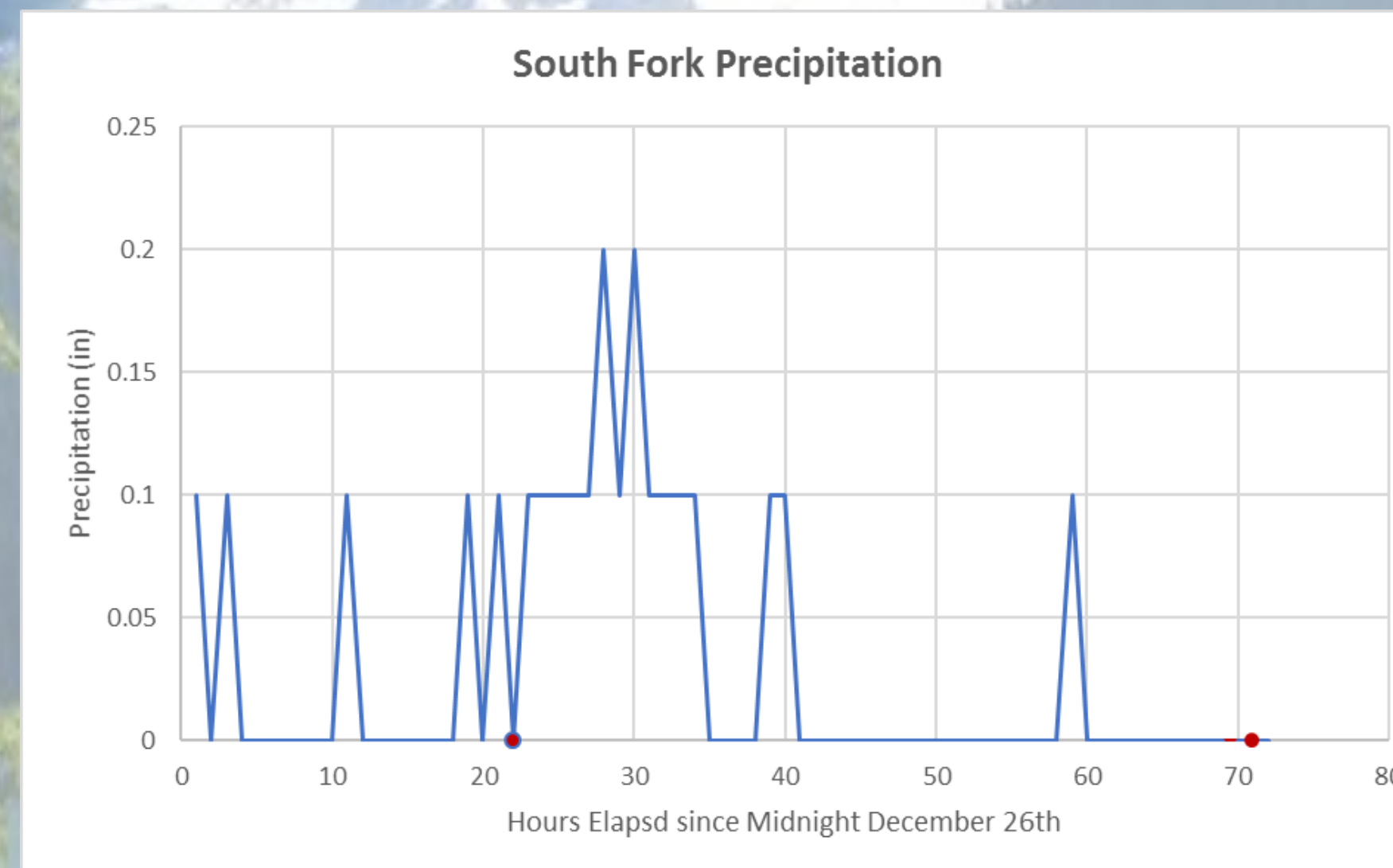


Figure 6. Hourly precipitation totals at the South Fork SNOTEL weather station during the December 27<sup>th</sup>-28<sup>th</sup> storms proceeding positive cryptosporidium samples in the source water.

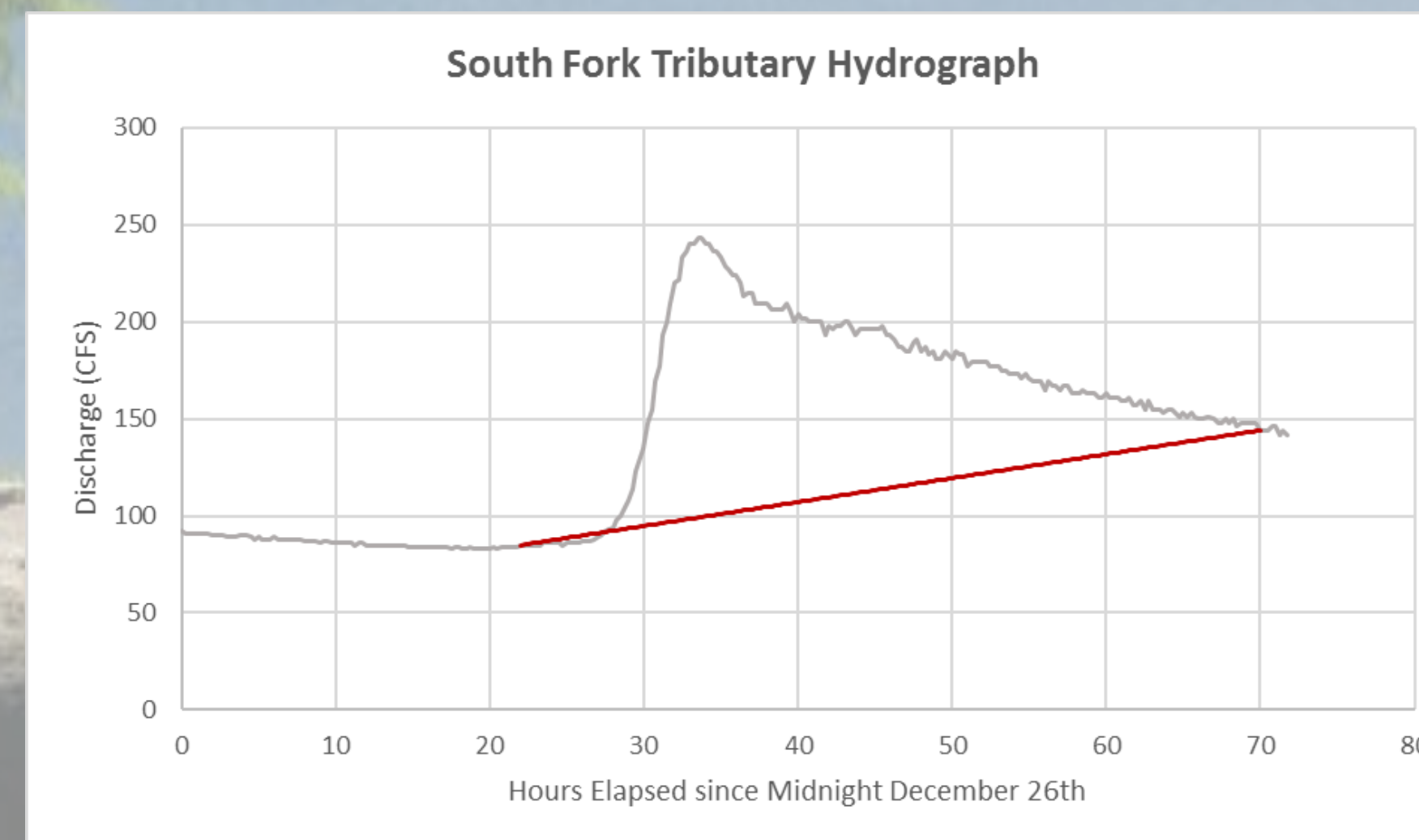


Figure 7. Discharge measured in the South Fork Tributary during the December 27<sup>th</sup>-28<sup>th</sup> storm proceeding cryptosporidium findings in the watershed.

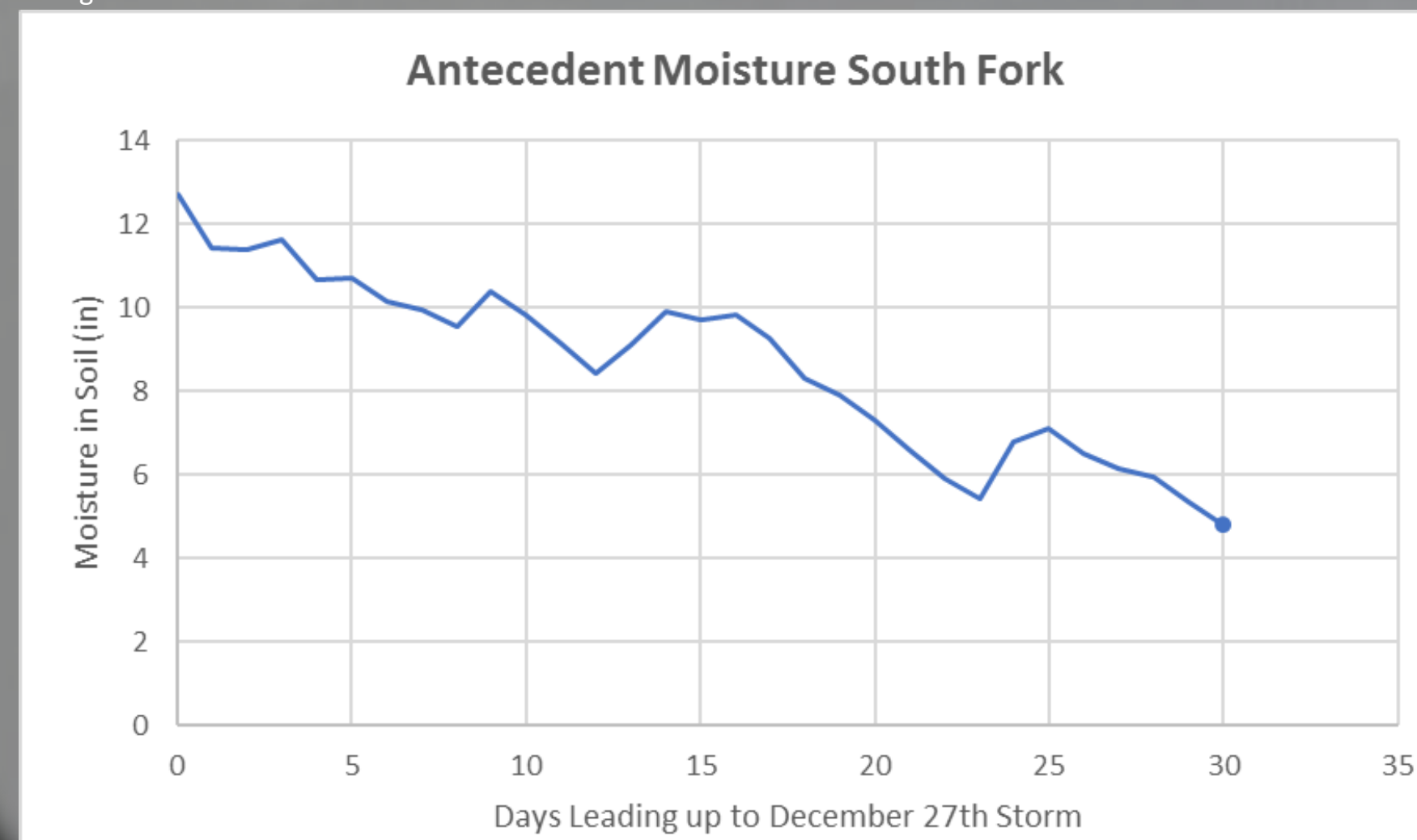


Figure 8. Soil Moisture levels in the South Fork sub-basin for the 30 days leading up to the December 27<sup>th</sup>-28<sup>th</sup> storm

## Why the Pacific Northwest?

- Climate change predicts show wetter winters more frequent high intensity storms in the future (Dalton et al., 2017)
- Researchers have found that increased storm intensity may lead to increases in turbidity, formation rate of DBP's, and microbial contaminants in water supply (Delpla et al., 2009, Whitehead et al., 2009)
- Oregon's three unfiltered systems all have different water quality risks

## Who can Afford it?

Water Provider	Number of households	Household Median Income	Current Monthly Water Rate (\$)	Percent Increase needed to pay for Filtration Plant	\$ Added to Monthly Bill
Baker City	4329	\$36,778	\$50.51	255%	\$128.98
Bend	33396	\$52,989	\$35.90	5%	\$1.69
Portland	254167	\$55,003	\$33.83	6%	\$2.20
Reedsport	1833	\$31,935	\$22.35	658%	\$147.03

- Smaller cities like Baker City and Reedsport would not be able to afford a filtration system and are better suited improving resilience through land use change in their watersheds