

Data Exclusions Due to Extreme High Flow

Options for the 2022 IR

Terra Lindgren

Texas Commission on Environmental Quality

Surface Water Quality Monitoring Team

Surface Water Quality Assessment Advisory Workgroup Meeting

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Outline

Background Information

Current Assessment Method

Possible Options for Future Assessments

Feedback and Discussion

Background - Water Quality Standards

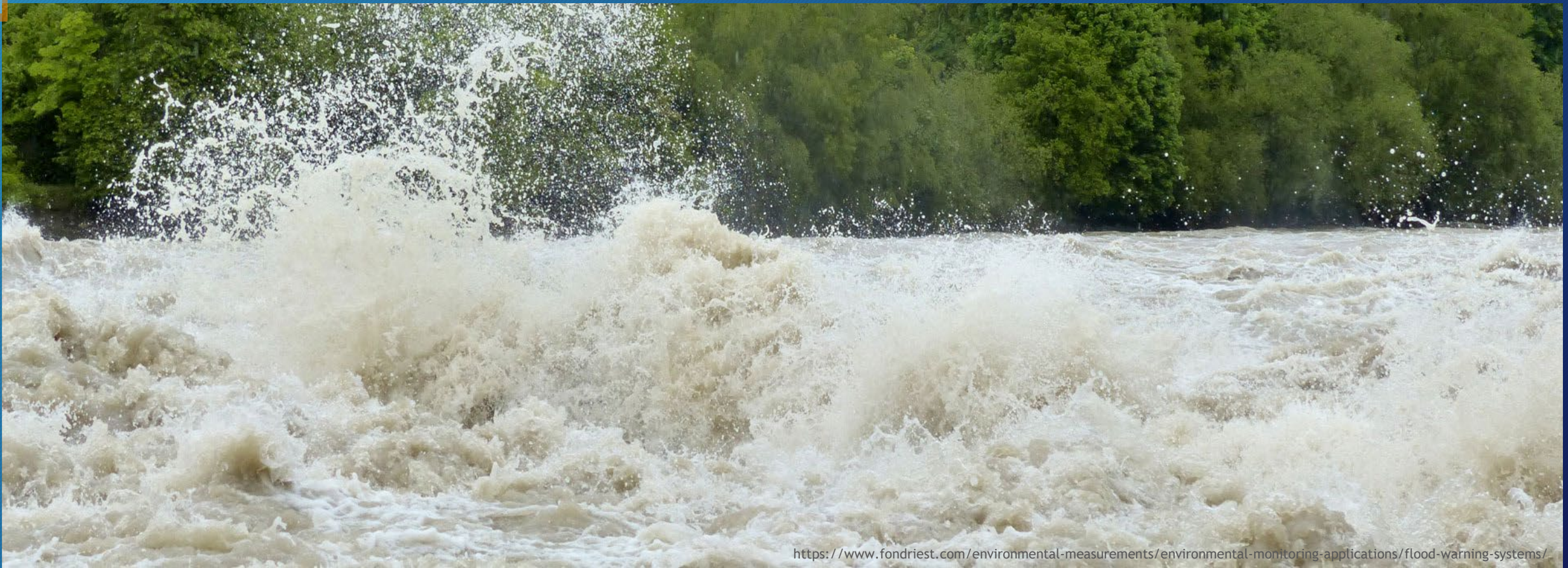
- According to the TSWQS, samples collected during extreme hydrologic conditions such as high-flows and flooding immediately after heavy rain should not be used to assess attainment.

§307.9(b) Samples to determine standards attainment are collected at locations approved by the commission. Samples collected at non-approved locations may be accepted at the discretion of the commission. Samples to determine standards attainment in ambient water must be representative in terms of location, seasonal variations, and hydrologic conditions. Locations must be typical of significant areas of a water body. Temporal sampling must be sufficient to appropriately address seasonal variations of concern. **Sample results that are used to assess standards attainment must not include samples that are collected during extreme hydrologic conditions such as high-flows and flooding immediately after heavy rains.** Further guidance on representative sampling, both spatially, temporally, and hydrologically, can be found in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415), Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat (RG416), and the TCEQ Guidance for Assessing and Reporting Surface Water Quality in Texas as amended.



Current Assessment Guidance

- Remove results for all parameters from sampling events:
 - When a flow severity of 4 (flood) is reported
 - Applied to all stations
 - On a case by case basis where the reported instantaneous flow measurement is greater than the 90th percentile
 - 90th percentile can either be determined from an established hydrograph for the nearest representative IBWC or USGS gage or by using statistical corrections to account for relative watershed size if there is no representative gage



<https://www.fondriest.com/environmental-measurements/environmental-monitoring-applications/flood-warning-systems/>

Possible Options for the 2022 IR

Option #1 - No Change to Current Method

Continue to implement removal of data collected where Flow Severity 4 is reported

- This is currently the only option we have that can be applied to all stations, gaged and ungaged
- For the 2020 IR, data were removed from 1,276 Sample Events where Flow Severity was reported as 4.
 - ~1% of assessed samples events

Continue to remove data from events where flow is greater than the 90th percentile on a case-by-case basis

- For the 2018 IR, this method was applied to 2 monitoring stations and was not applied to any additional stations for the 2020 IR

Option #2 - Flow Based Approach

- Continue to remove data from sample events where flow severity is reported as 4
- Remove data based on instantaneous flow from all SWQM stations located within ¼ mile of a USGS gage if flow is identified as ‘extremely high’
- To be done in all instances not case-by-case
- 3 options to identify ‘extreme high-flow’
 - Bankfull discharge
 - Dramatic increase in slope on an established hydrograph
 - 90th percentile or another percentile greater than the 90th



Bankfull Discharge

- What is bankfull discharge?
 - According to NOAA, bankfull stage is an established gage height at a given location along a river or stream, above which a rise in water surface will cause the river or stream to overflow the lowest natural stream bank somewhere in the corresponding reach.

Get Bankfull Stage as defined by NOAA

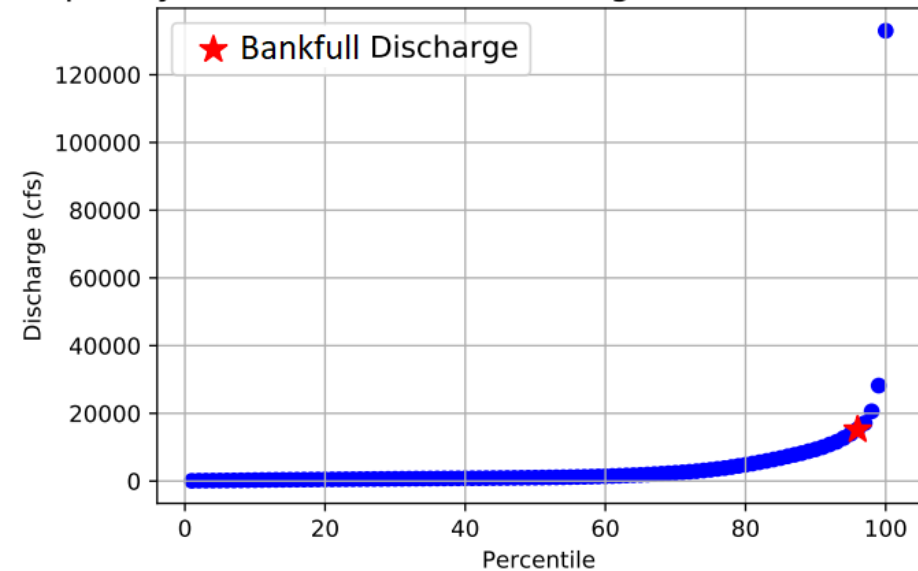
Find Bankfull Discharge using the stage-gage relationship

Assign Bankfull Discharge to SWQM Stations with $\frac{1}{4}$ mile of gage

Bankfull Discharge

- Handout: Bankfull_Discharge.pdf
- Flow frequency curves for the 83 gages that have a defined bankfull discharge.
- This method can be applied to about 4% of stations, based on the 2020 list of stations assessed.

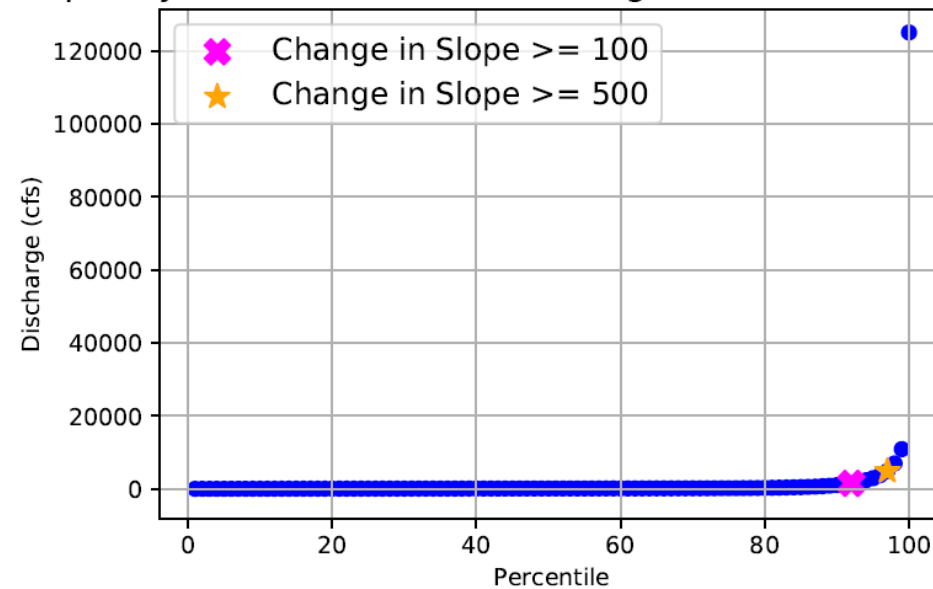
Flow Frequency Distribution for USGS Gage 08062500 from 1924 to 2020



Dramatic Increase in Flow Frequency Curve

- Use a flow frequency curve from 131 gages to determine at which percentile the flow increases dramatically
 - Handout: [Flow_Frequency_Slope.pdf](#)
 - Change in Slope ≥ 100 : First point along the curve where the difference in slopes is greater than or equal to 100
 - Change in Slope ≥ 500 : First point along the curve where the difference in slopes is greater than or equal to 500
- This method can be applied to about 16% of SWQM stations, based on the 2020 list of stations assessed.

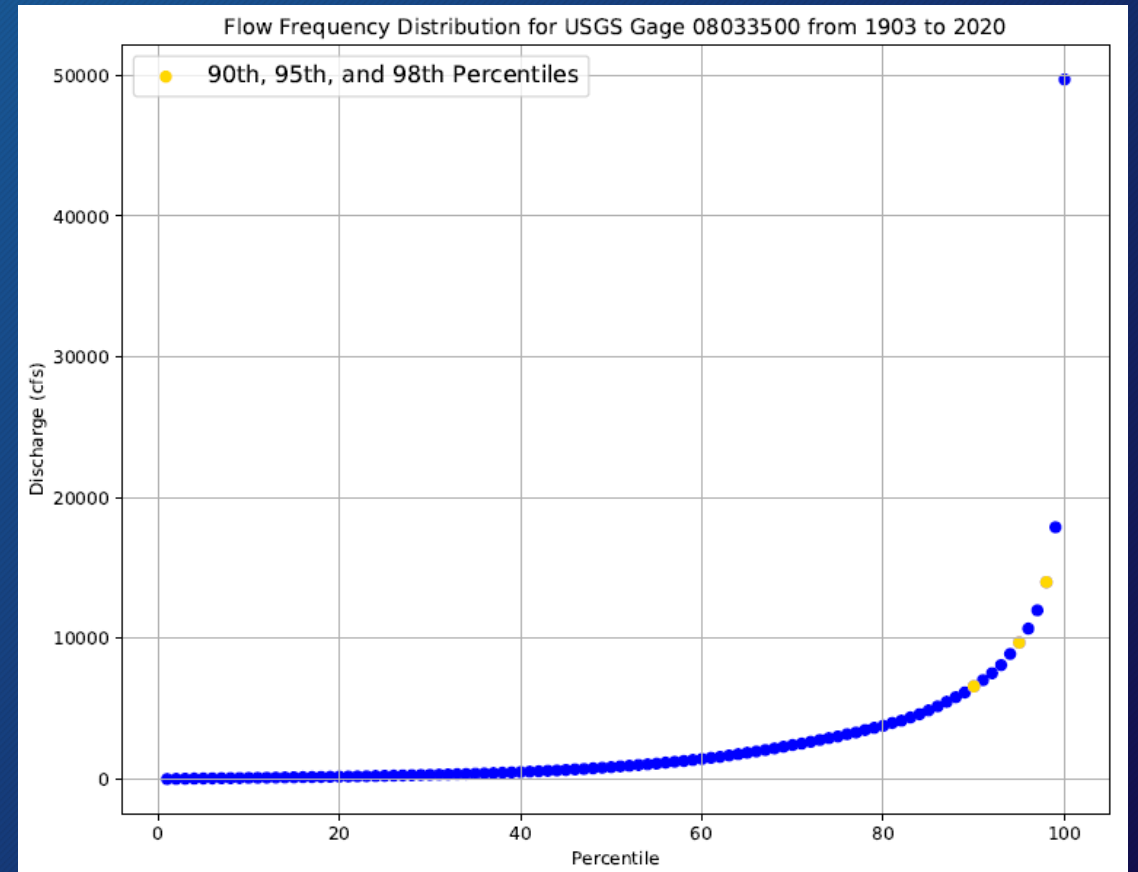
Flow Frequency Distribution for USGS Gage 08211000 from 1939 to 2020



Formula for finding change in slope: $\frac{\Delta y_2}{\Delta x_2} - \frac{\Delta y_1}{\Delta x_1}$

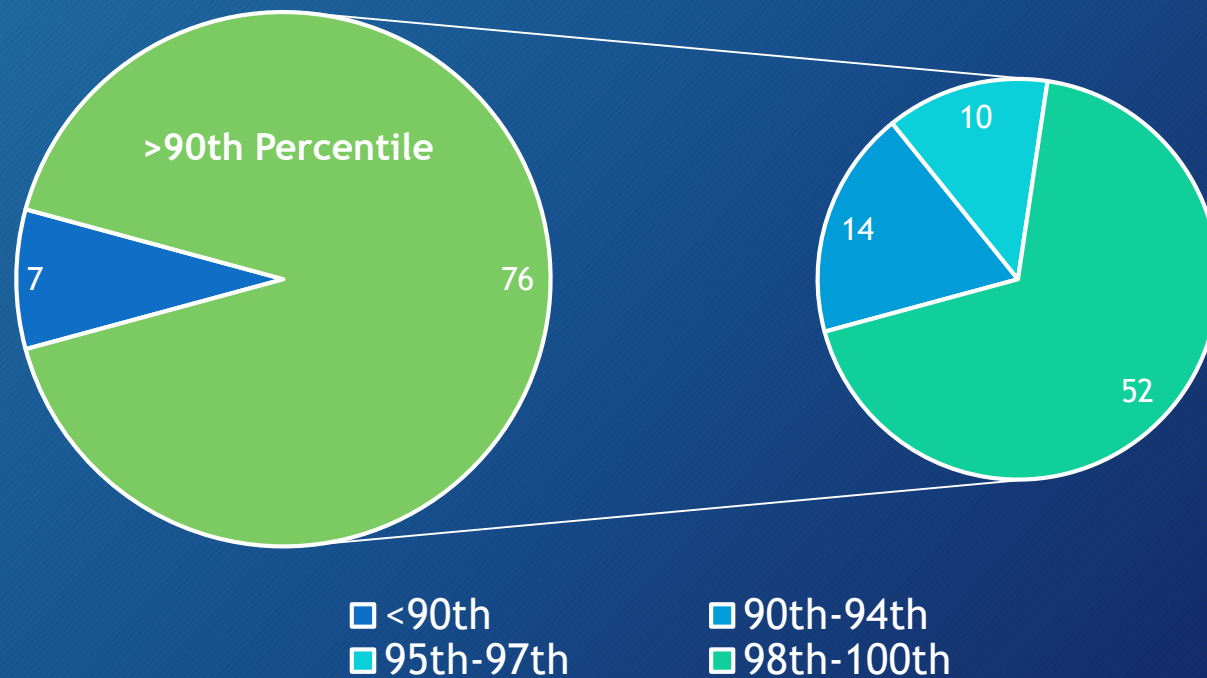
Percentile-based Approach for all Gaged Stations

- Handout: [Flow_Frequency_Distributions.pdf](#)
- Possible options: 90th, 95th, or 98th Percentile
- This method can be applied to about 16% of SWQM stations, based on the 2020 list of stations assessed.



Bankfull Discharge and Percentiles

Flow Percentile Category based on Bankfull Discharge Values for 83 USGS Gage Stations



Amount of Data that Would be Excluded

- Approximately 122,180 Sample Events assessed in the 2020 IR.
- 9,440 Sample Events from gaged stations.
- 345 of these sample events had a Flow Severity of 4 and data were removed.

Extreme High Flow Level	Number of Sample Events*
Bankfull Discharge	84
90th Percentile	550
95th Percentile	243
98th Percentile	75

*Not including sample events where Flow Severity = 4



Feedback and Discussion

Should we leave the existing high-flow exclusion as is?

Should we consider flow-based options for gaged stations? If yes, which ones?

Are there options we should consider for ungaged stations?

Are there other options we should consider for gaged stations?