

Numeric Model Study

Colorado School of Mines and UCWET

Fraser Valley Watershed

Environmental Conditions – Drought and Water Diversions

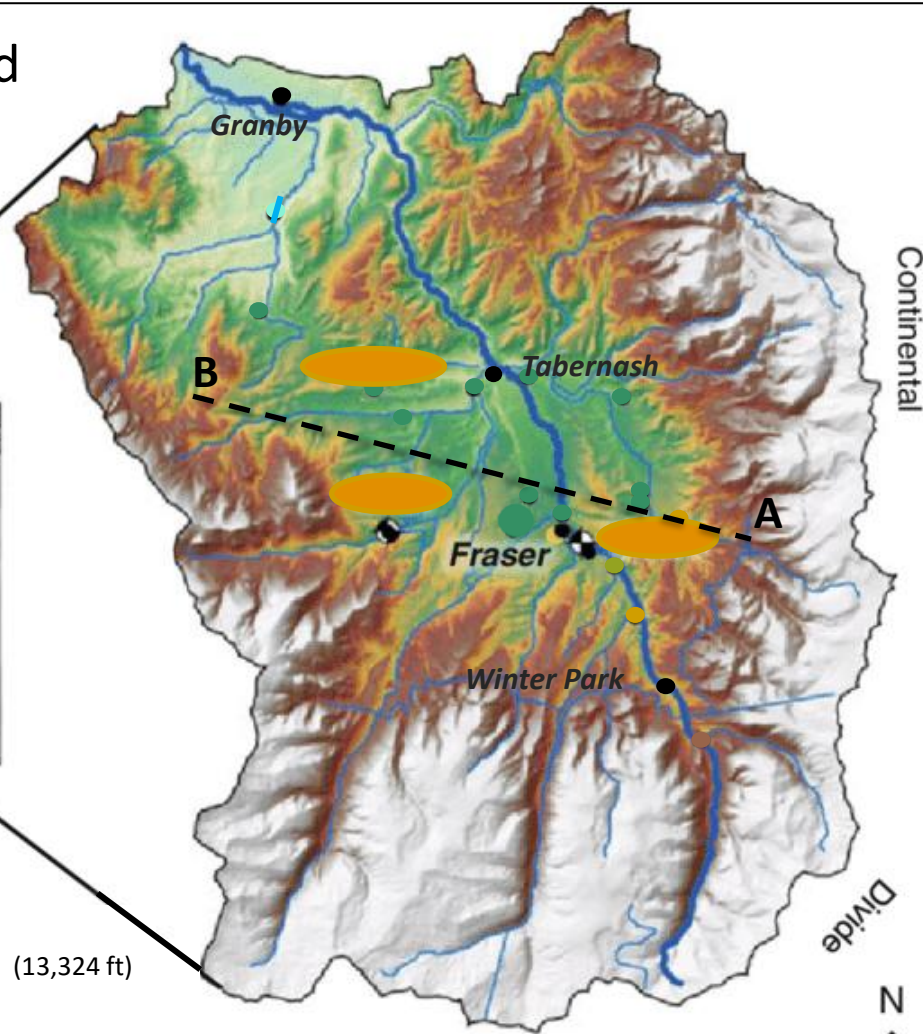
Aquifer Stratigraphic and Hydraulic Considerations

Aquifer Structural Characteristics

Project Goals

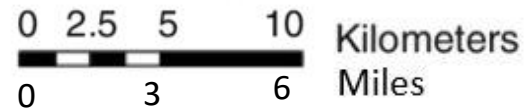
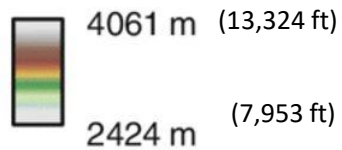
Fraser River Watershed

Grand County, Colorado



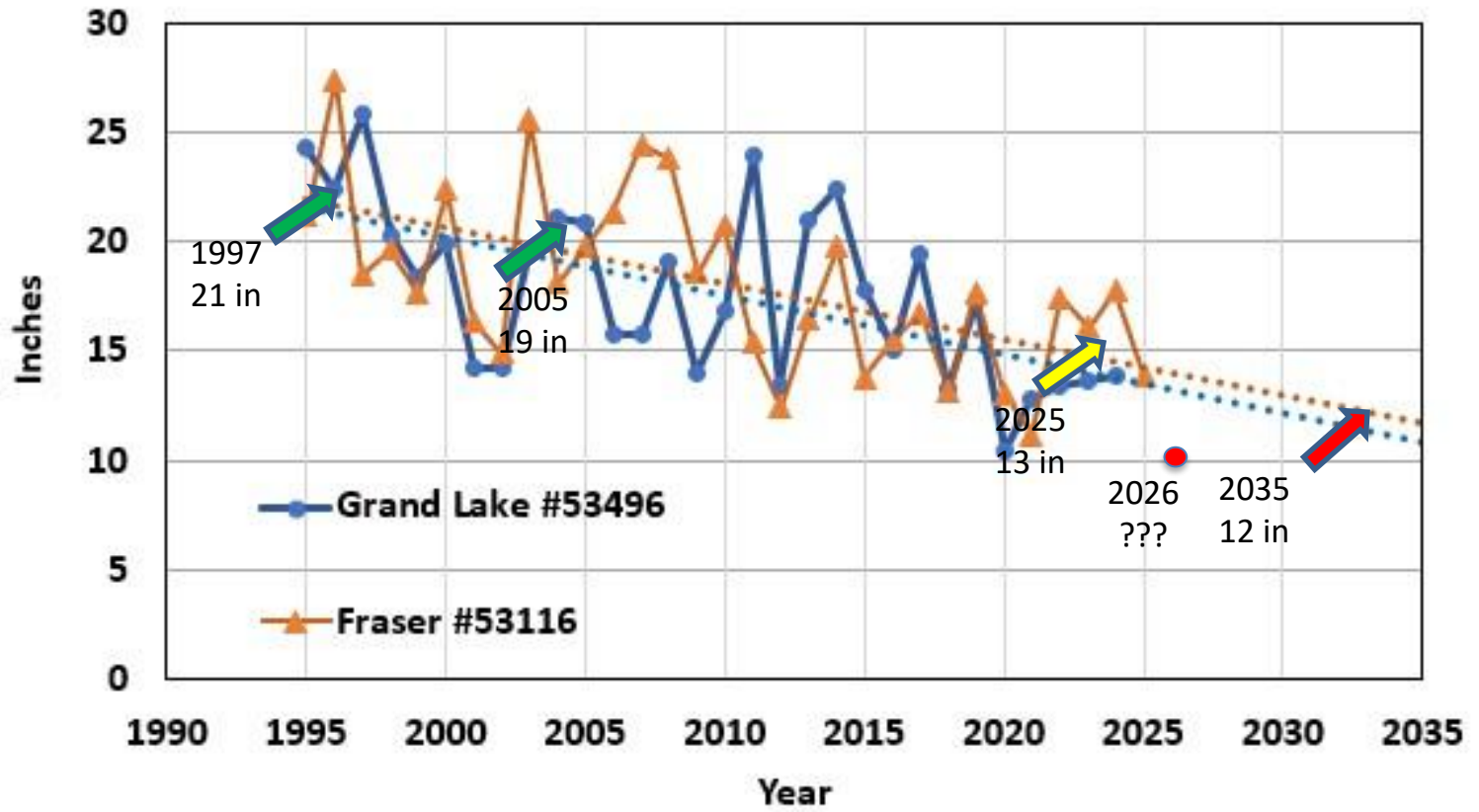
Legend

Elevation

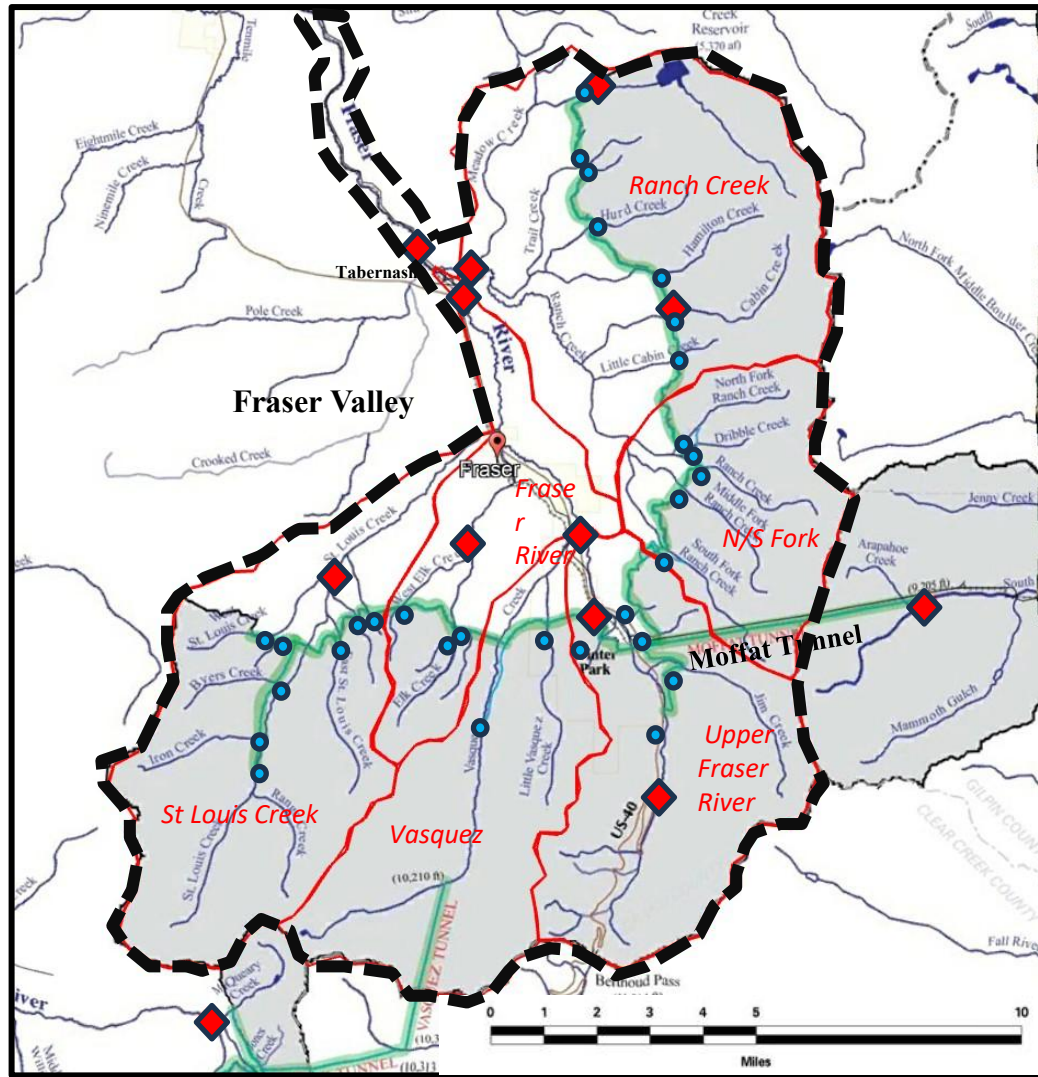










Annual Precipitation - Grand County

Colorado Climate Center - CSU

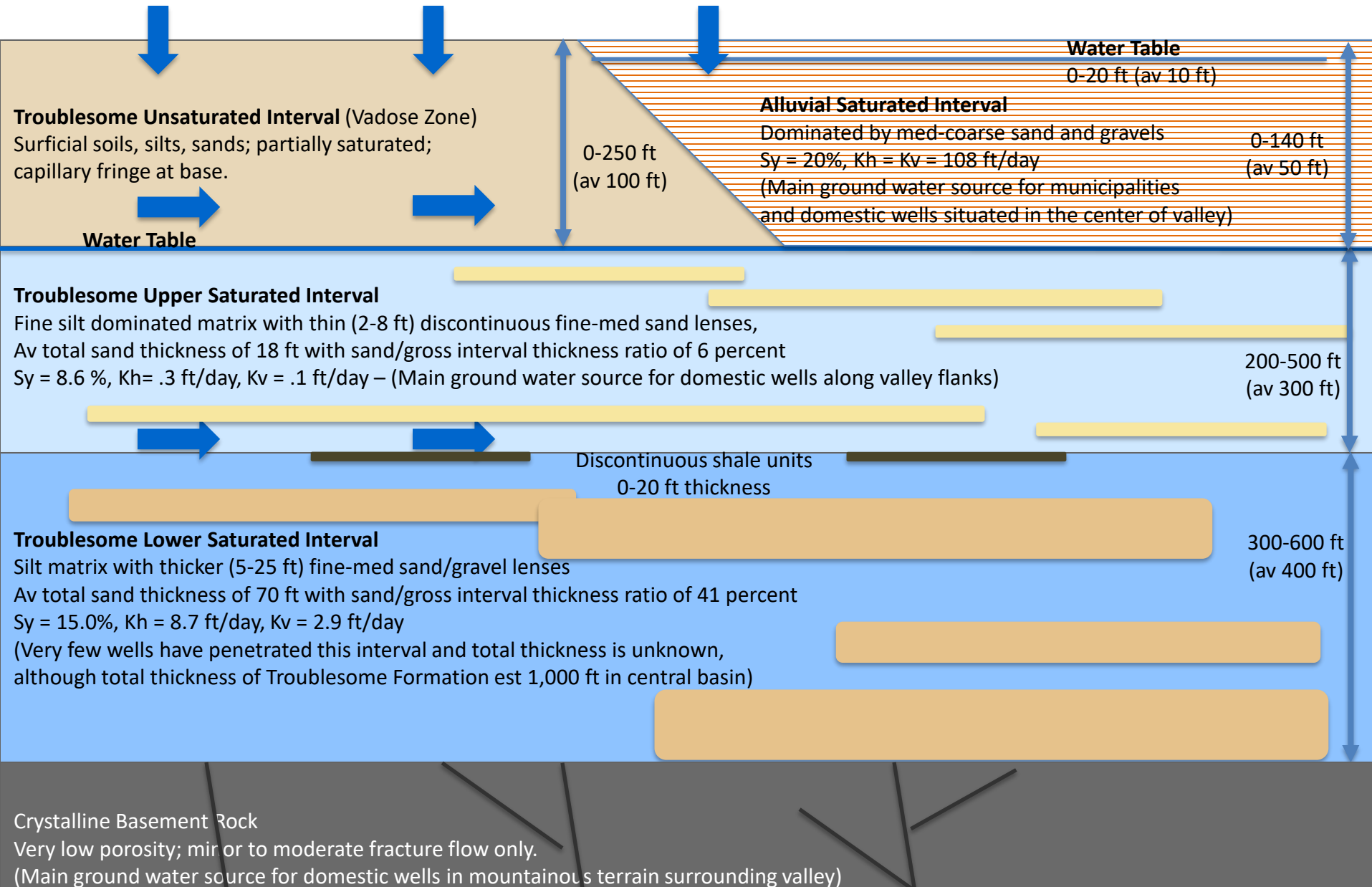


Fraser Valley Watershed Water Diversions



-  Surface Streams & Wetlands Impacted by Water Diversions
-  Moffat Tunnel Collection System
-  Major Lake or Reservoir
-  Major Stream or River
-  Major Canal or Aqueduct
-  Stream Watershed Outline
-  USGS Gaging Station
-  Diversion Point

Conceptual Unconfined Alluvial and Troublesome Aquifers – Four-Layer System

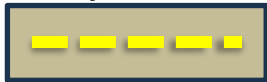


Fraser Valley Watershed Sub-Basins Near Surface Alluvial Aquifer Sectors

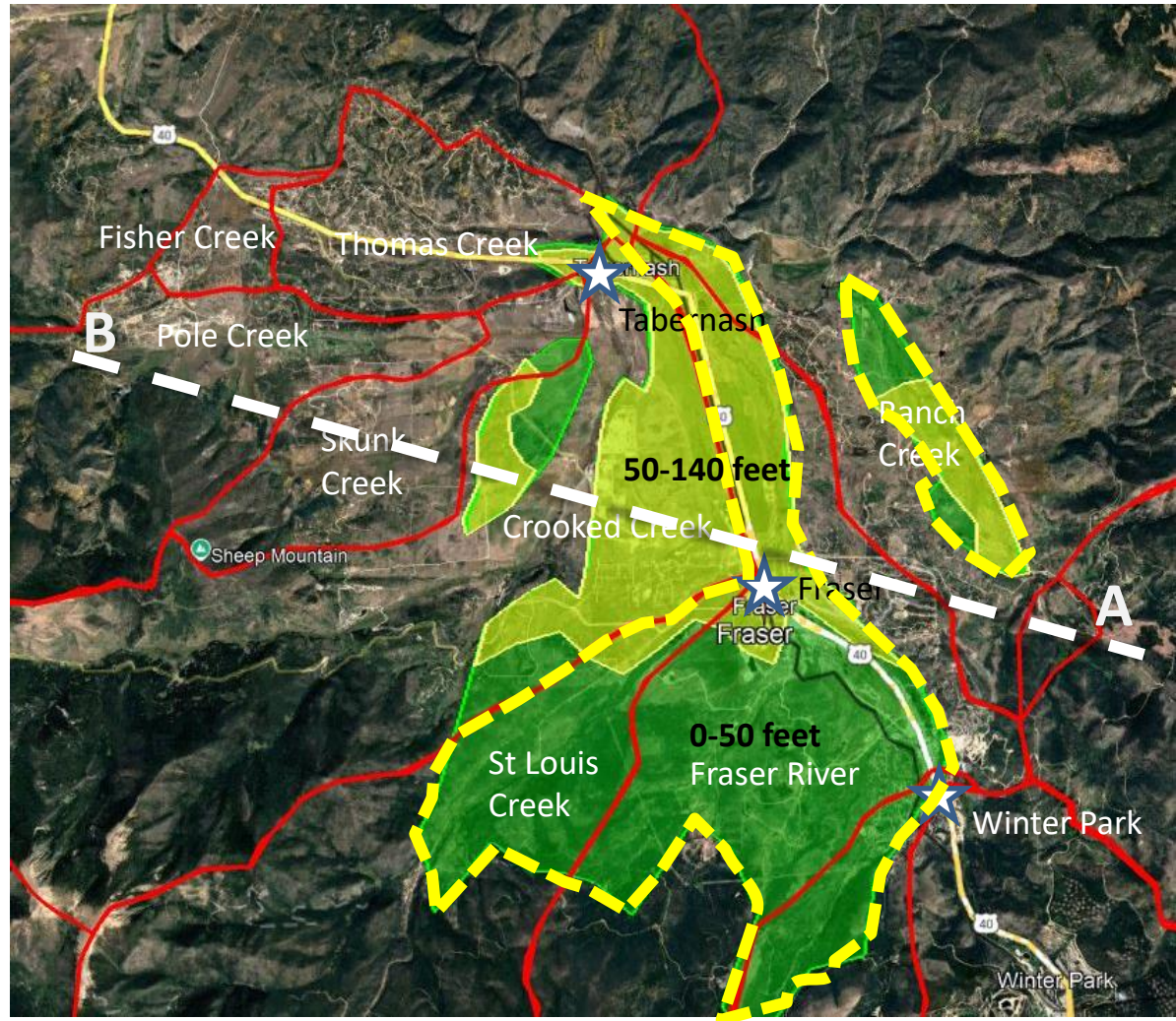
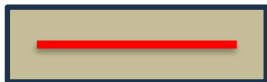
Fraser Valley Watershed Basins – Near Surface Alluvial Aquifer Distribution

- Water source for domestic wells/municipalities
- Producing wells predominately in central valley
- Up to 140 feet thickness / 23 sq mi

Near Surface Alluvial Aquifer Impacted by Water Diversions



Stream Watershed Outline

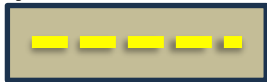


Fraser Valley Watershed Sub-Basins Upper Troublesome Aquifer Sectors

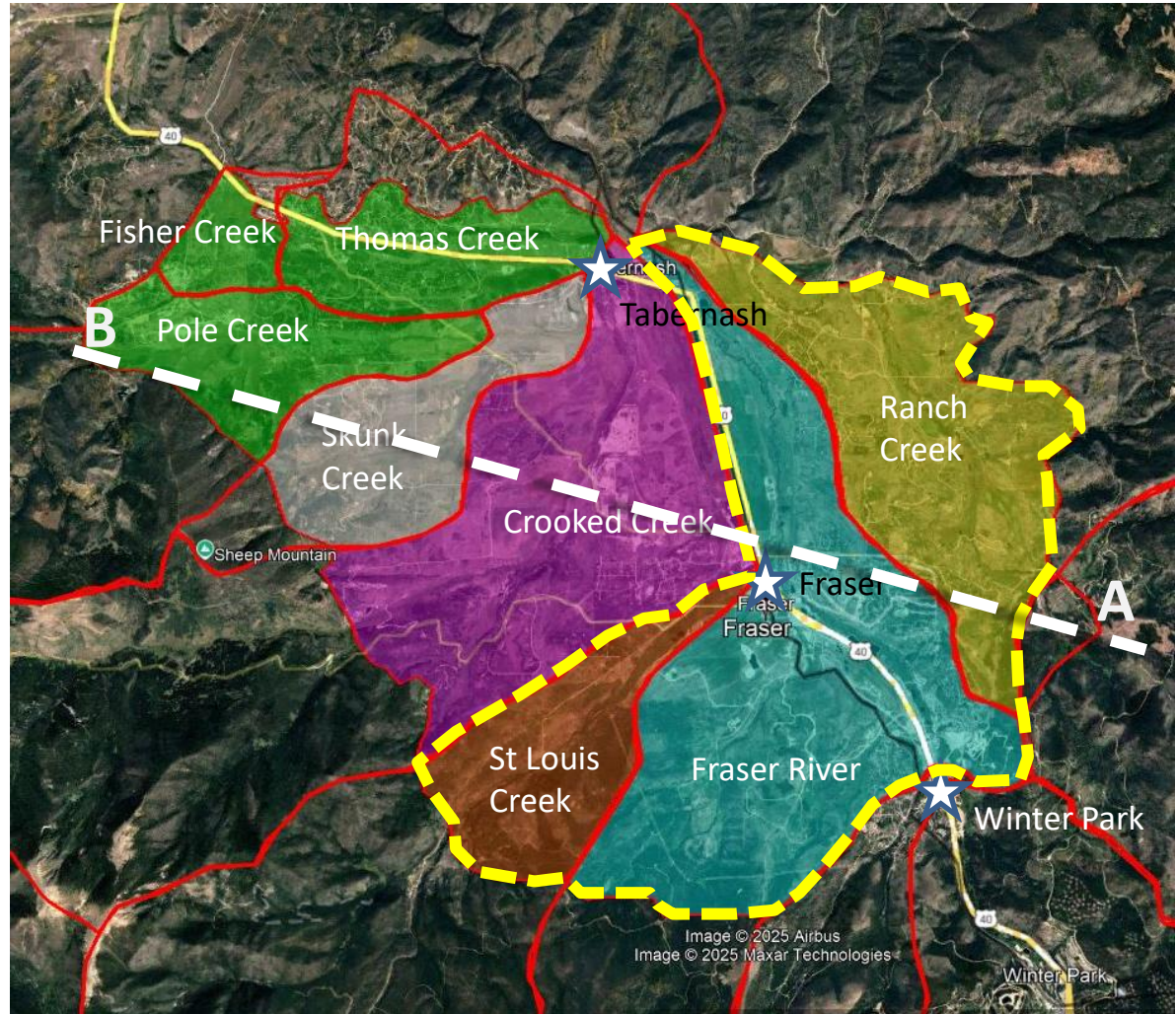
Fraser Valley Watershed Basins – Upper Troublesome Aquifer Sectors

- Water source for most domestic wells
- Producing wells predominately along margins of the valley
- 400-500 feet thickness / 45 sq mi

Troublesome Aquifer Impacted by Water Diversions



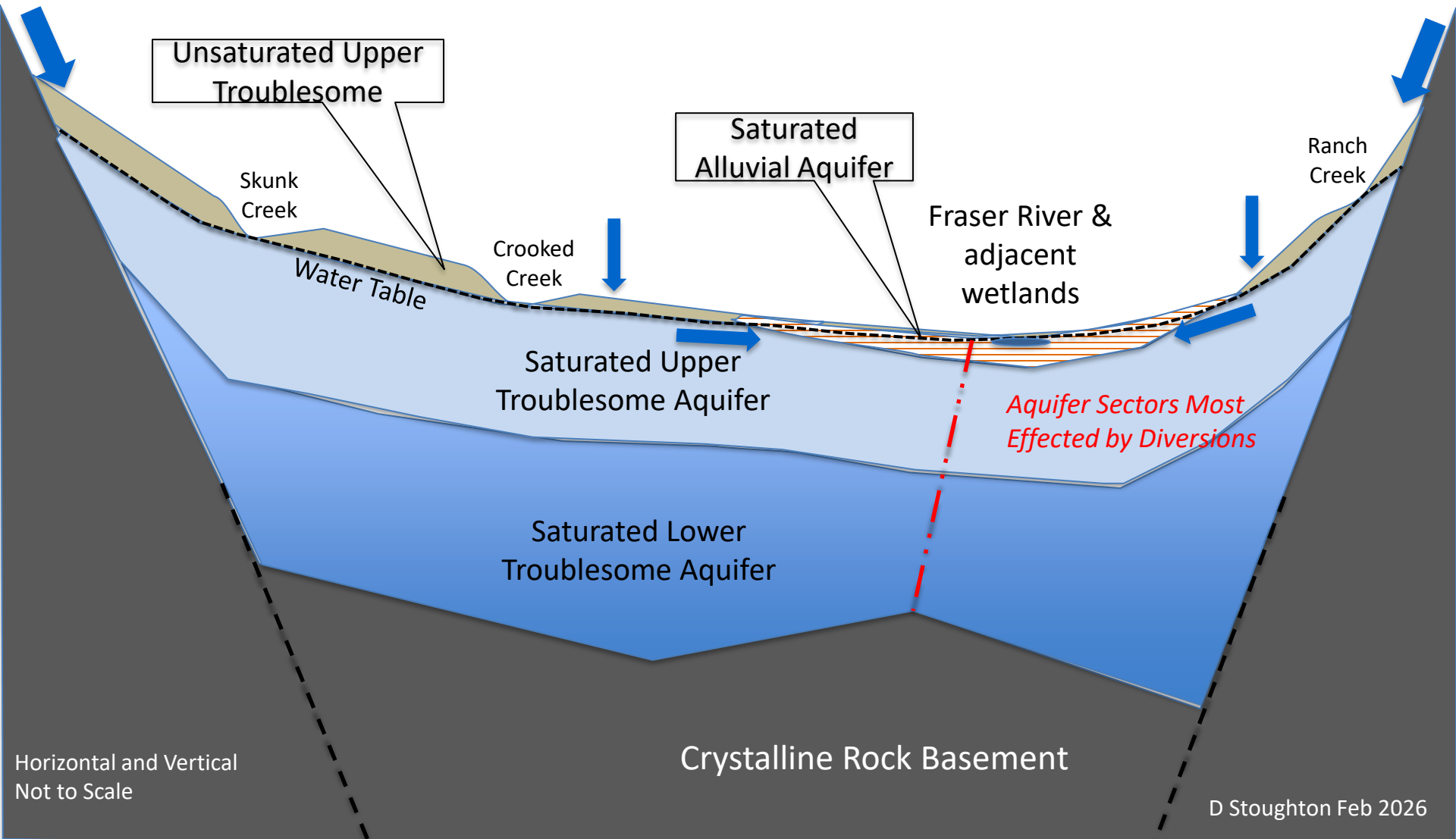
Stream Watershed Outline



Fraser Valley Generalized Structural Cross-Section

NW
B

SE
A



Horizontal and Vertical
Not to Scale

Crystalline Rock Basement

D Stoughton Feb 2026

General Observations

- The Alluvial Aquifer is predominately sand and gravel whereas the Upper Troublesome is dominated by silt with thin stringers of sand
- Available water release from the sediment (specific yield-Sy) is almost 2.5 times greater in the Alluvial Aquifer versus the Upper Troublesome Aquifer
- Water hydraulic flow (conductivity-Kh) approximately 360 times faster horizontally and over 1,000 times faster vertically in the Alluvial Aquifer than the Upper Troublesome Aquifer
- The age of water in the Alluvial Aquifer is less than 50 years whereas the water age within the Troublesome Aquifer can be over 500 years or several thousand years
- Basin boundary and inter-basin faults may add impediments to water flow
- Water diversions will affect recharge of the aquifers on the southern and eastern portions of the basin and therefore have reduced water for surface stream flow and replenishing wetlands
- Continued drought conditions will affect the entire watershed and recharging the aquifers and thus reduce surface stream flow and possible lower water table

Possible Numeric Modeling Goals – Phased Approach

- Build finite difference numeric model to replicate entire Fraser Valley watershed and incorporate all four key aquifer members with associated hydraulic properties and structural and faulting characteristics
- Assess the water flow dynamics in 3D sense implementing current conditions
- Tie-in with watershed water accounting/budget, streamflow (Lotic study) and water table mapping
- Incorporate other studies inclusive field site observations for calibration of past, present and possible future conditions
- Test various scenarios of drought and diversions on aquifer recharge and interaction with surface stream flow and water table levels
- Quantify the water volume impact, water table drawdown and timing for certain scenarios including environmental high impact events (i.e. wildfire)
- Get a better understanding of the uncertainties and sensitivities of the geology and hydraulic flow parameters used in the model
- Provide a baseline study for future investigations and research
- Others ??????