## Science Camp #170802.8

02-04 August 2016 @ the Condo, the Nelson Cabin, and surrounding area



#### Advisors

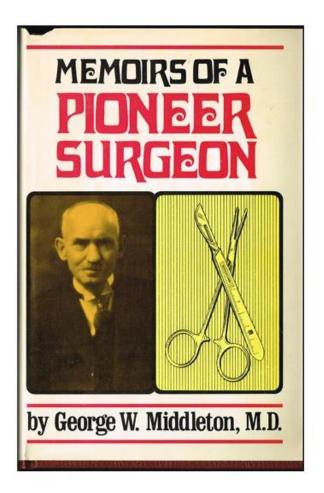
H. Roice Nelson, Jr., Andrea S. Nelson, Paul F. Nelson, Benjamin B. Nelson

#### Attendees

Ethan E. Nelson, Grant M. Nelson, Colby C. Wright, Taylor R. Wright, Ella D. Nelson, Halle N. Wright, Bobbie Sophia Waldron, Dallin Spencer Nelson, Avalyn Joyce Wright, Rachel Lee, & Ian Lee

#### Water is a Critical Natural Resource

#### **Historical Water Issue in Cedar City**



Memoirs of a Pioneer Surgeon

and it remained for us to carry it out. Water systems outside cities of larger size were innovations in the state at that time and they met with a great deal of opposition from people who, living closely at home, could not know the advantage of such an improvement. As we proceeded with the work of having trenches dug and the pipes placed in position, the opposition grew. It tended to link itself with the opposition to prohibition, so we had a double fight.

When we were in the thick of it and feeling was running high, J. Golden Kimball, the humorous president of the Seventies can order of the Mormon Church) came along on a preaching tour. I went to him and asked him to say something in his sermon to bolster our cause. He readily consented. When he had his audience worked up to a high pitch with his humor he said, "Just look at that filthy stuff running down the ditches in your streets. If you don't quit drinking that filthy stuff, I prophesy in the name of Israel's God it will kill three-fourths of you!"

We had levied a frontage tax on all the abutting property, allowing the owners who so wished to pay it out in labor. A big army of laborers turned out with their picks and shovels to take advantage of this opportunity. Mr. Edgar Clark, a fine gentleman from Parowan, came down one day when the trenches were under construction. When he saw this army of men at work, he said to me, "This is the finest sight I ever saw in my life. For forty years I have been coming here, and have seen these men sitting on the street-corners whittling sticks, and now to see them engaged in some useful constructive work for the benefit of their community is a sight worth coming from Parowan to see."

There were those at first who would not touch the water out of the system, although it was clear, while the water in the ditches was full of silt and organic impurities. However, one by one they gave in until the new system became very popular. Memoirs of a Pioneer Surgeon

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The success of this much-needed improvement seemed to initiate a spirit of progress which has continued ever since.

Piping of the water was a dramatic demonstration of the relationship of typhoid fever to an impure water supply. Every year when the floods used to begin coming down the canyon there would be an epidemic of typhoid fever, with several fatalities. As if by magic these epidemics stopped completely as soon as our new system was supplied by pure water from the mountain springs.

A few years after this, when Dr. T. B. Beatty, Secretary of the State Board of Health, was trying to induce all the larger towns to build water systems, he went to attend a mass meeting of the citizens of the village of Kamas. They had this matter under consideration. One old settler was much opposed to his town going into so unnecessary an enterprise. He said the water of Kamas tasted so good that he was always glad to get back home so he could get a drink of it.

Dr. Beatty said to the old man, "Now, while you are very definite in your opinion, there seem to be others who favor the water system. I think we can arrange it so you will all be happy. We will put in the system, and all those who are satisfied with the taste of the water can take it unmodified. You can mix enough barnyard manure with yours to give it the exact flavor you prefer. So everybody will be satisfied."

There was one great source of satisfaction to me during these years of hard medical work and political activity in that the best element of the community stood squarely behind me, and this, of course, meant the big majority of citizens. I shall never forget their loyalty and support and shall hold them in grateful remembrance as long as I live. Eventually, however, a time came when even their loyalty could not compensate for the complexities of my life.

I remember well the day this feeling crystallized in me. It



Basalt

Basalt

Unit 3

Basalt

Unit 2

http://snobear.colorado.edu/Markw/geog5321 webpage 04.html

http://cbgwma.org/index.php?option=com\_content&task=view&id=60&Itemid=115

Recharge into interflow zones exposed by fold

if wateris

present.

Slue arrows depict

predominant groundwater

movement. Flow top area of basalt unit.

Joit 1 interflow

Basalt Unit 4

Basalt Unit 3

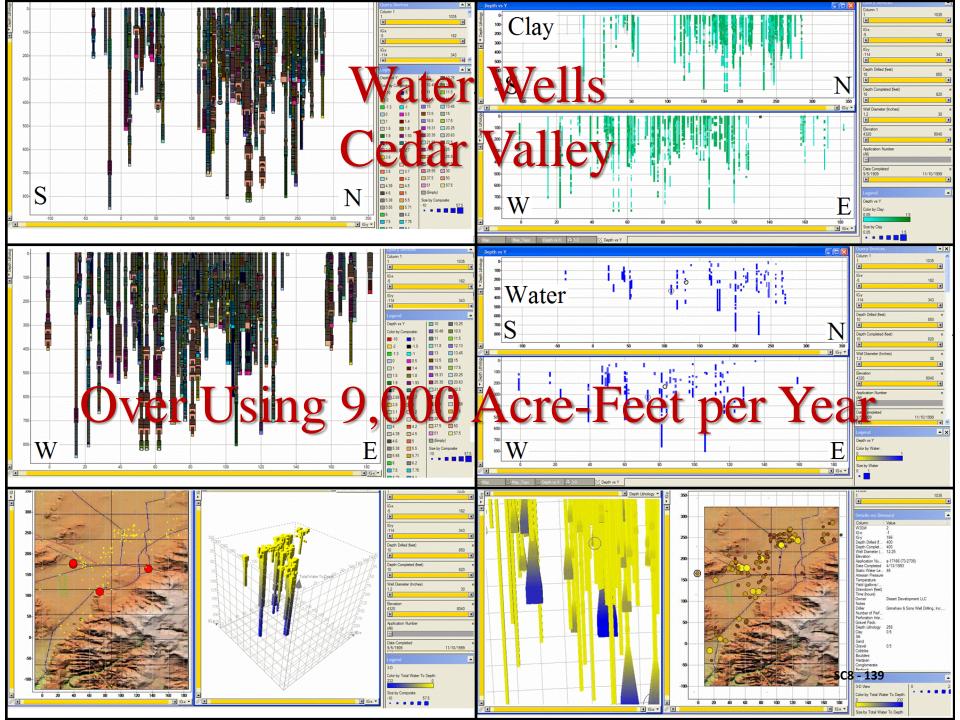
Basalt

Unit 2

Basalt Unit 1 Bedrock dips to the east;



• Faults bounding the valley disrupt baseflow, especially into the Cedar Valley basin fill aquifer, which is isolated by clays and is very shallow.



## Geology & Geophysics Are Key

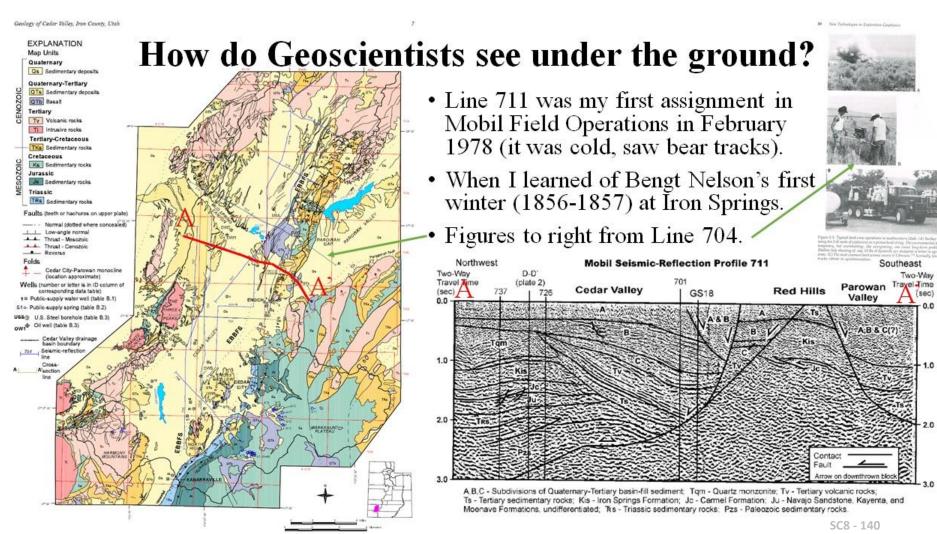
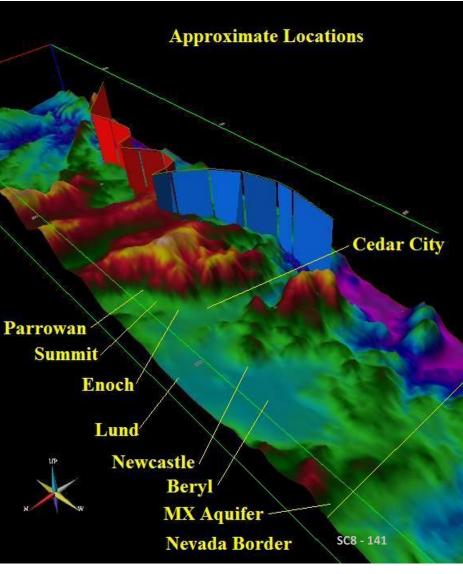


Figure 6. Simplified geologic map of Cedar Valley drainage basin and adjacent areas. EBBFS is eastern basin-bounding fault system. See figure 5 for stratigraphic column, and appendix A for correlation of map units with those on plates 1 and 2.

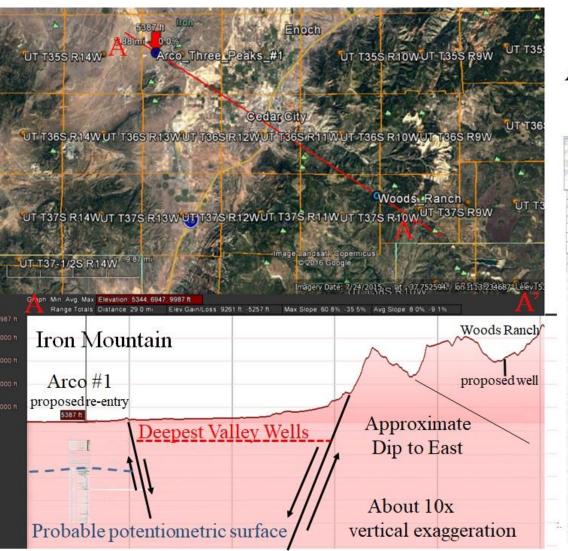
#### **Mobil Line 711 cross-section**

## UT TEES RIEW UT TEES RIIW UT TEES REW UT T32S R18W SS R18W UT T38S R17W UT T38S R14W UT T38S R12W UT T38S R10W UT T38S R3W W UT 1348 R16W UT 1548 R14W UT 1348 R12W UT T355 R 15W UT T355 R 14W UT T355 R 10W UT T355 R 9W S R18W UT T37S R15W UT T37S R14W UT T37S R13W UT T37S R10W UT T37S R9W Mobil 711 About 11x vertical exaggeration

# Lake Powell Pipeline



## Water at Iron Springs Where Bengt & Ellen Nelson Lived



## Arco #1 – Woods Ranch cross-section

 An opportunity to test the Fractured Quartz Monzonite Aquifer is to reopen this well.

Top Qm = 2,322'

Fractured: 2,500'-2,615'

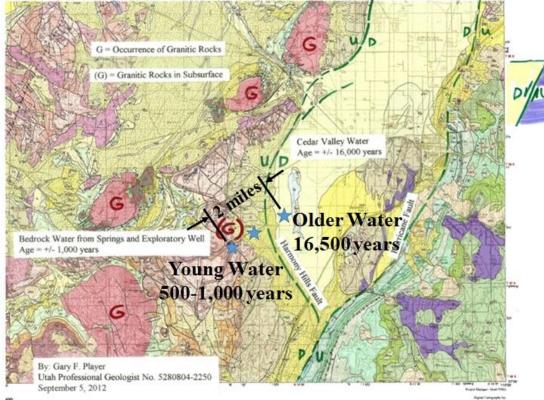
Fractured: 2,960'-3,050'

 The proposed test in the Cretaceous rocks is at Woods Ranch or Sheepherder's Cabin.

#### **Untapped Fractured Quartz Monzonite Aquifer Photograph of water in Blowout Pit at Iron Mountain**



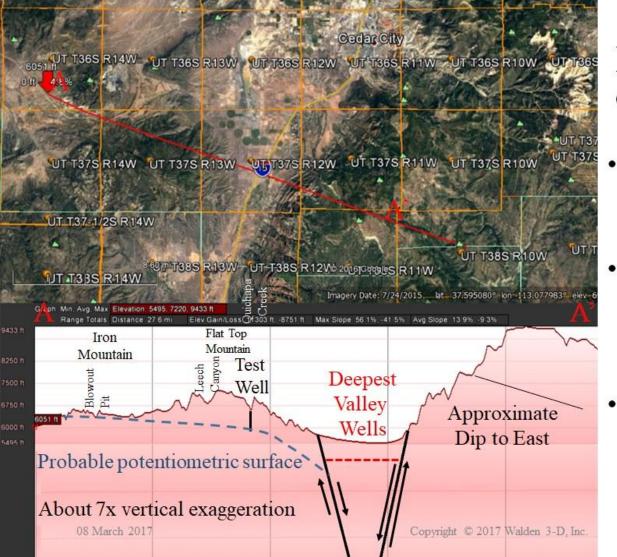
Photograph by Gary Player



## Water from Fractured Quartz Monzonite Fills Blowout Pit and Other Iron Mine Pits

SC8 - 143

# Fractured Quartz Monzonite Wells Will Hopefully Be "New Water"

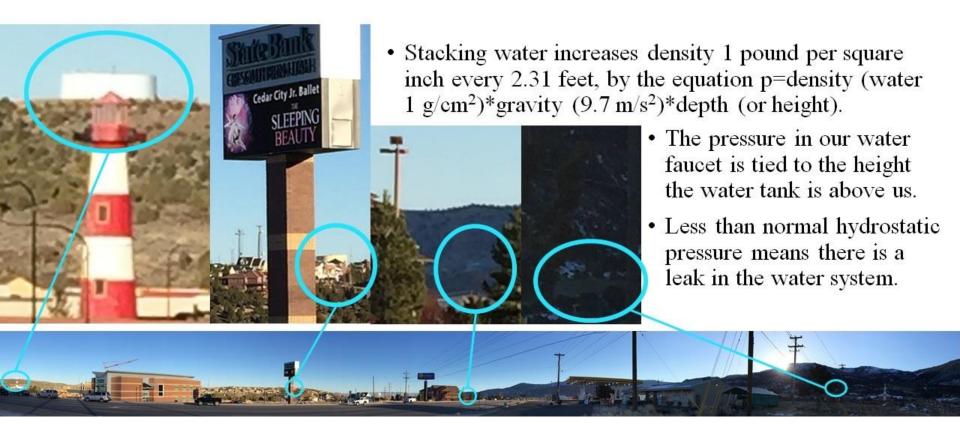


## **Blowout Pit Cross-Section**

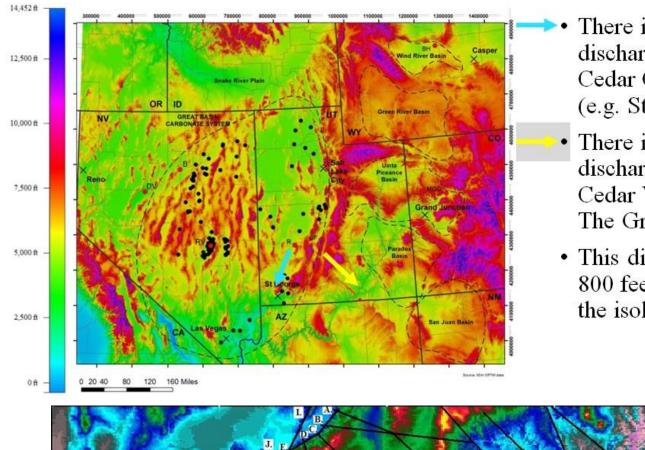
- Dip on bedrock to east drives water falling on Cedar Mountain east.
- Throw of Hurricane Fault allows water to drop down 5,000 feet to the porous Jurassic Sandstone.
- Water filling Blowout Pit tested in Quichapa Creek test well.

## Hydrostatic Pressure Is Key

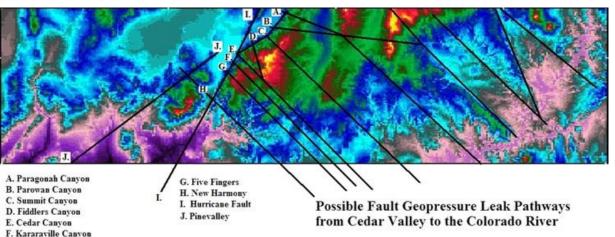
#### Water Tanks in Cedar City demonstrate hydrostatic pressure



#### **Looking at the Bigger Picture**



- There is significant baseflow discharge from The Great Basin (e.g. Cedar City at 5,000 feet) to the south (e.g. St. George at 3,000 feet).
- There is equal or larger baseflow discharge from The Great Basin (e.g. Cedar Valley) to the southeast (e.g. The Grand Canyon).
- This discharge is much deeper than 800 feet, with water running below the isolated Cedar Valley Fill Aquifer.



Less Than
Normal
Hydrostatic
Pressure

SC8 - 146

### **Untapped Cretaceous Aquifer** above the repeated road repairs in Cedar Canyon

(note most significant flow is on east facing outcrops, because beds dip east)





# Water Flowing East Is Within Drainage Basin

What is the cost to repair the road?

Compared to the cost of drilling a deviated hole and draining the water out of the cliffs to prevent landslides?

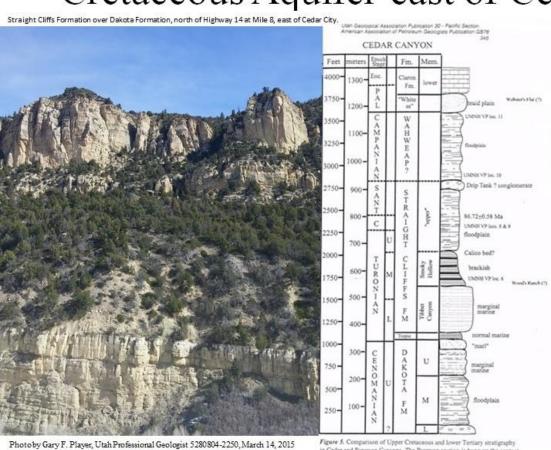






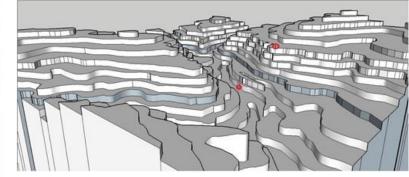
## Deviated Hole Requires No Pumps and Turbines in the Well Generate Power

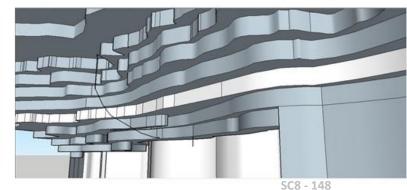
Cretaceous Aquifer east of Cedar City





in Cedar and Parowan Canyons. The Parowan section is hung on the contact between the Claren and Grand Castle Formations.





#### **Notes**



#### 2017 Science Camp

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