Flagstaff Water Works

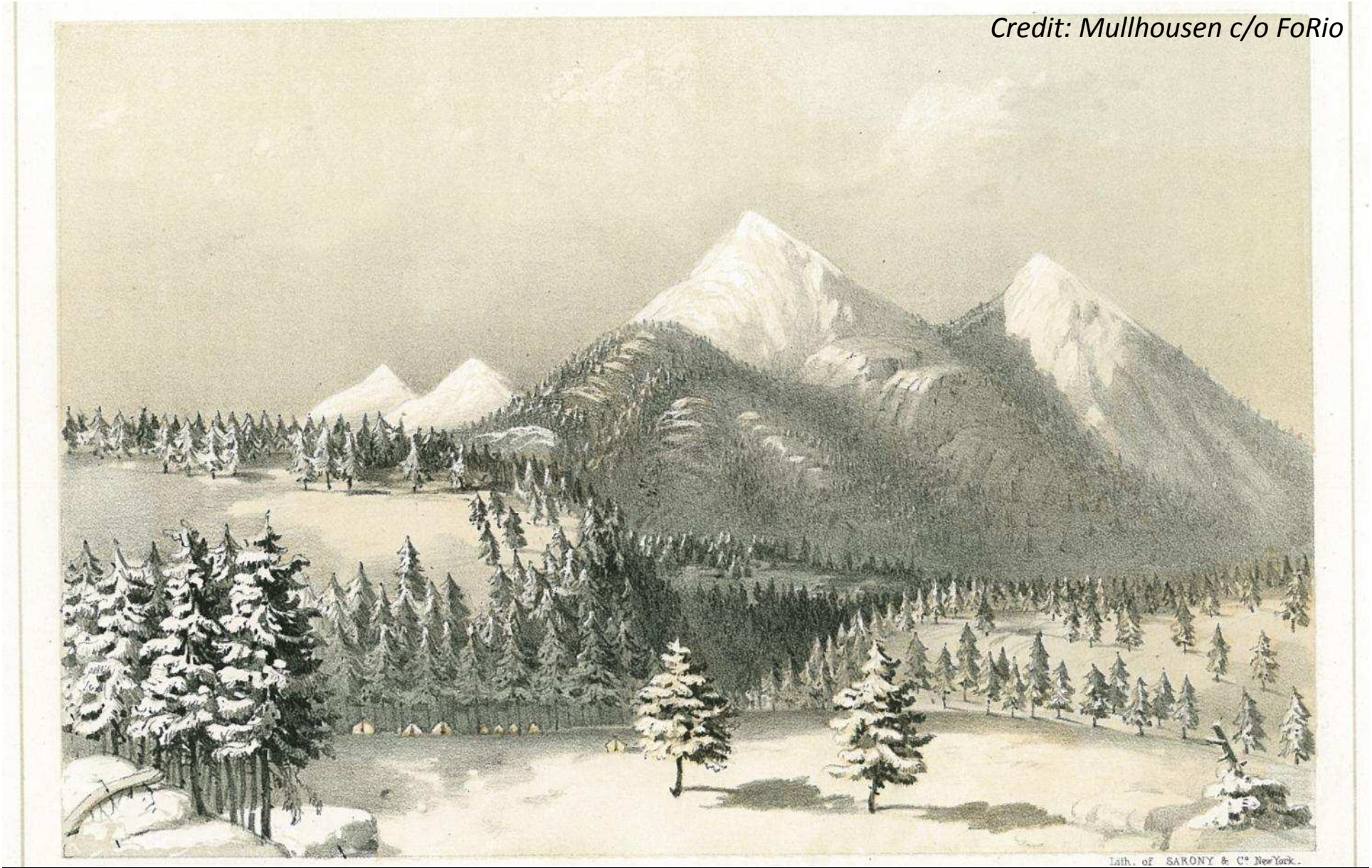
Part I: Origins

by Brad Garner

c/o Bob Hart

This is Part 1 of a series on Flagstaff's water, describing at a conceptual level the 3 places from which Flagstaff derives its water supply.

This originally was designed as a live and verbally presented talk.

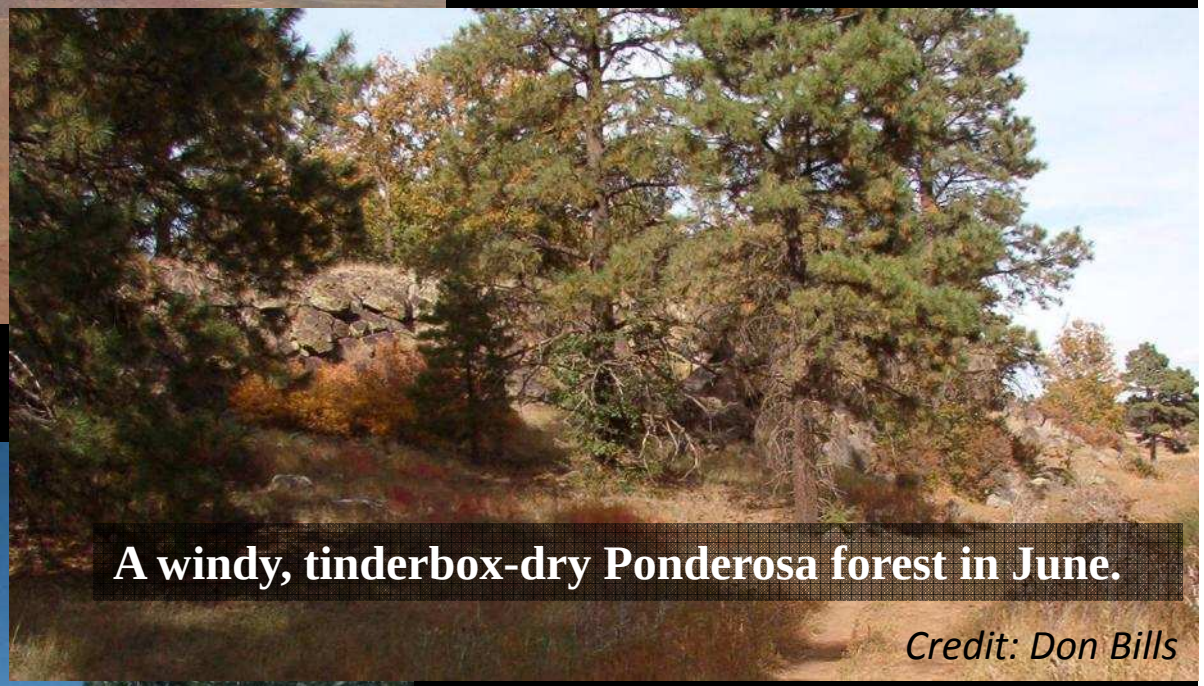


Credit: Mullhousen c/o FoRio

When the first settlers arrived in Flagstaff area in the 19th century, they were thirsty.
What did they see, water-wise?
Take a moment, close your eyes and conjure in your mind's eye the Flagstaff region.

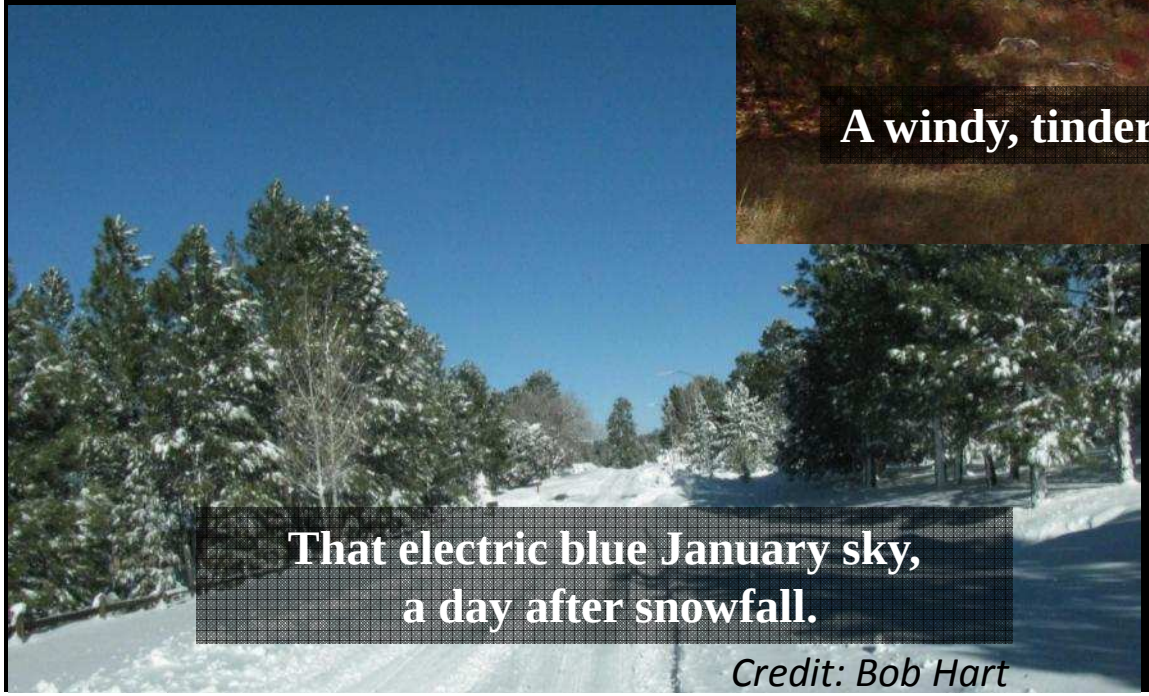
Pastel hues of the solemn painted desert.

Credit: Jon Mason



A windy, tinderbox-dry Ponderosa forest in June.

Credit: Don Bills

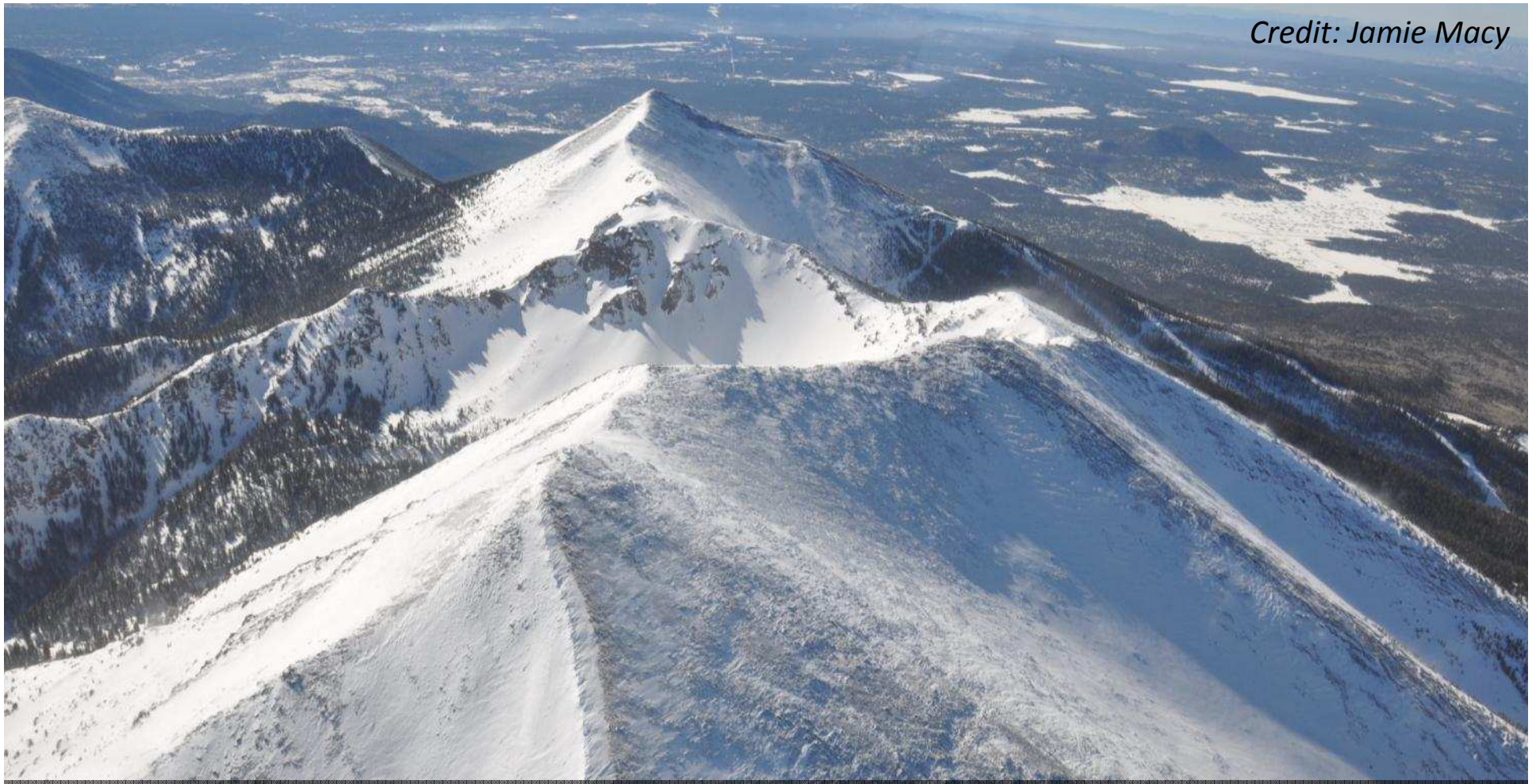


That electric blue January sky,
a day after snowfall.

Credit: Bob Hart

Flagstaff's first water supply was a spring—a natural upwelling of water from the depths of the earth to its surface; quite a thing, if one pauses to consider.

These springs, these first springs, were in and around the small and new pioneer town. They were small and wouldn't do long for a young, growing town.

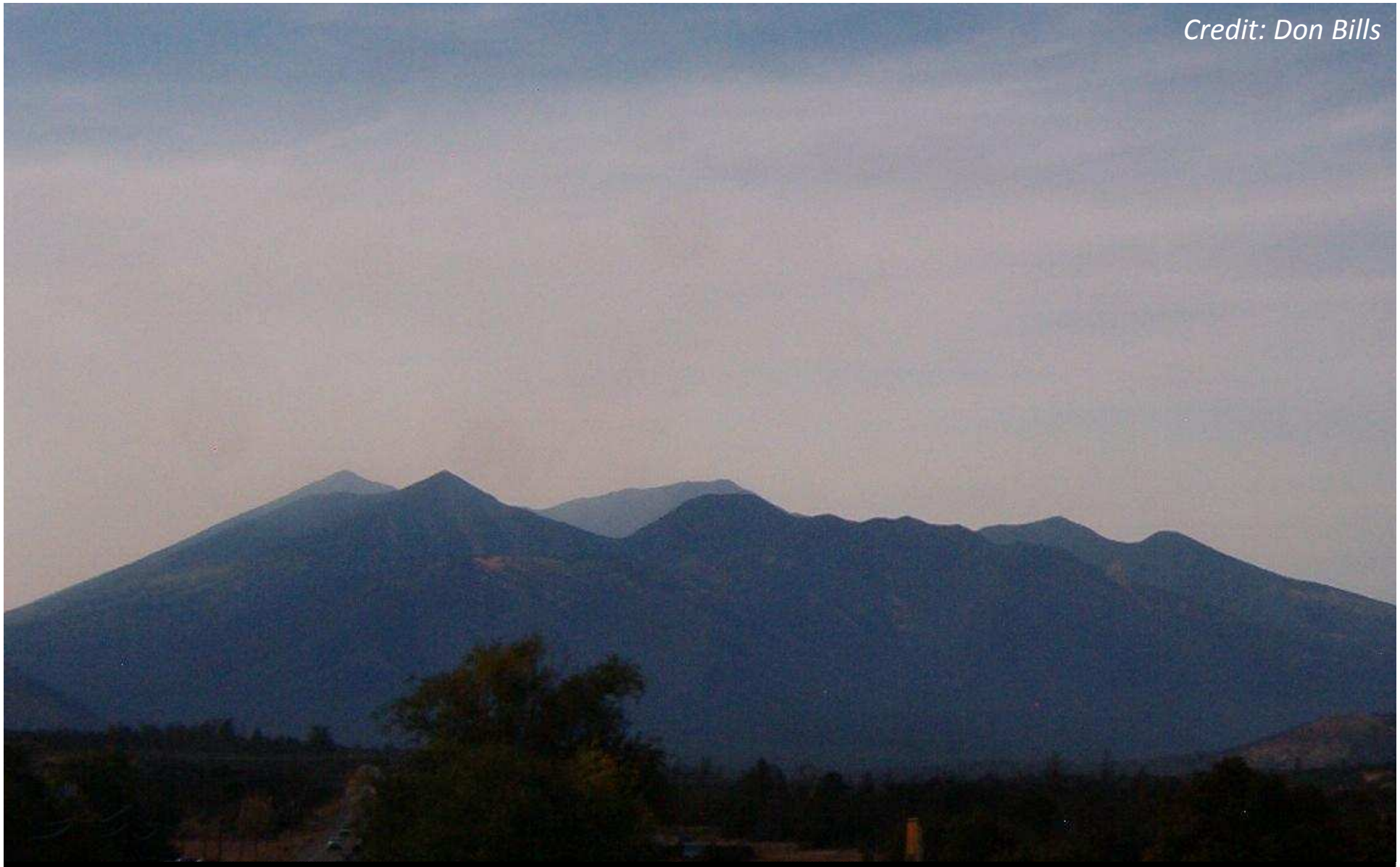


Flagstaff Water Comes From the Mountain

So Flagstaff's intrepid pioneers went in search of a larger water supply.
They found one—Flagstaff's first major water supply—in the nearby mountains.

Springs were found in the Inner Basin of the San Francisco Peaks. Many springs.
The San Francisco Peaks, like something out of a John Denver song.

Such a seeming improbability in Arizona.



Why are there springs there?

Is it as the medieval theory held? That the Earth is some organism that drinks seawater and excretes fresh water from the land? Fanciful, but no.

It’s more like this: a spaghetti colander filled with sand.

Pour water onto it, some spills off, some soaks in.
The water that soaks in MOVES. It doesn’t pool up and do nothing.

It moves from areas of higher water pressure to areas of lower pressure—springs.
To use it as a water supply, Flagstaff puts pipes in front of springs to capture their flow.

Humans, through intelligence and decisions (placing a pipe to capture a spring) have CHANGED the natural system.
Now the water that once flowed away from this spring, to feed a tree, to create a habitat, won’t get to where it was going.

But Inner Basin springs are a fickle water supply. They are small. In dry years they don't always flow. So it wasn't long before Flagstaff went in search of another water supply.

Flagstaff Water Comes From the Stream

They found it.

Flagstaff is described as a mountain town.
A classic, Rockwell-esque mountain town?
With a burbling, perennial stream coursing through downtown serving as a water supply?

Credit: Don Bills

Not so much. Flagstaff streams are feast and famine!

How could one harness water from a feast-and-famine stream?
How could one reserve such water for measured use?

Credit: Don Bills

With a reservoir.
In the early 20th century Flagstaff built a reservoir, an ancient technique.
Construct a berm across the width of a valley, and water backs up.
Seen here is Flagstaff's dam for Upper Lake Mary.

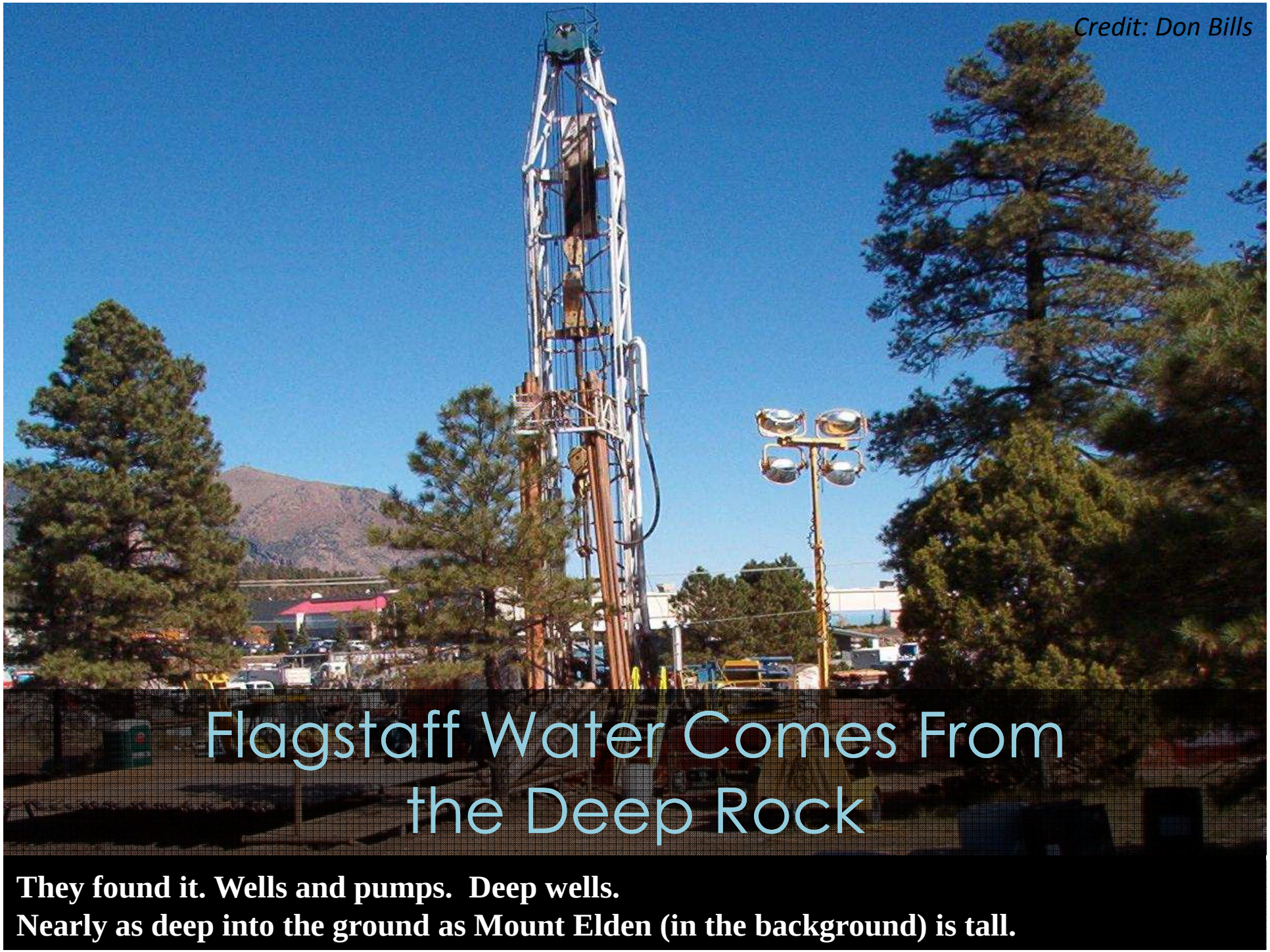
Conceptually, dams all are the same; they vary only by scale and construction technique.

Powell Reservoir is formed by a dam; it's some 1,500 times larger than Lake Mary.

Humans, through their intelligence and decisions (placing a dam across a valley) have CHANGED the natural system.

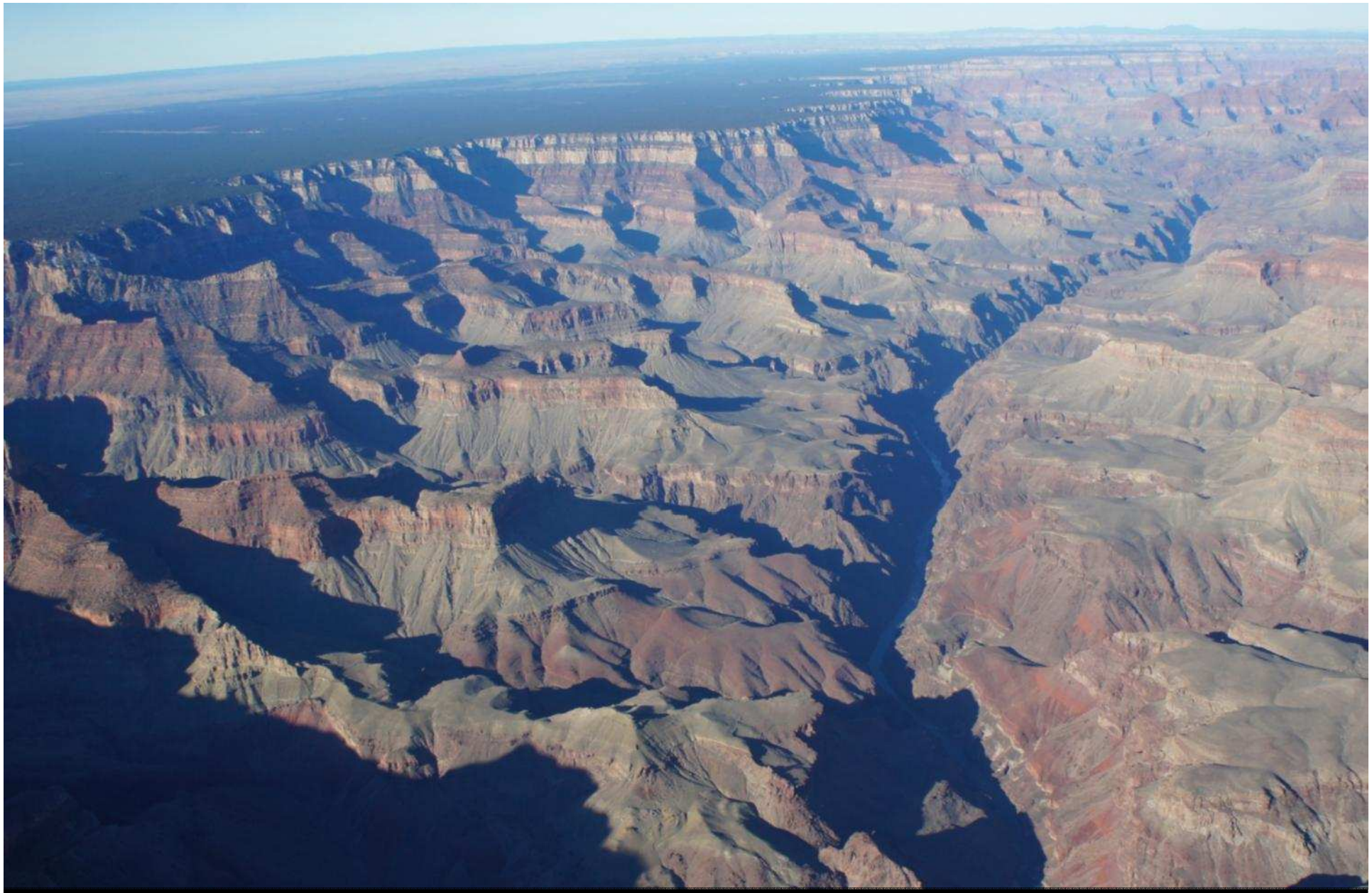
Lake Mary has changed the system.
Water that once flowed to watercourses downstream, like Walnut Canyon Nat'l Monument, now won't get to where it was once was going.

But Lake Mary is in some ways a fickle water supply;
as of 2014, it hasn't been completely full since April 2008.
As Flagstaff grew, by the 1950s another water supply was sought.

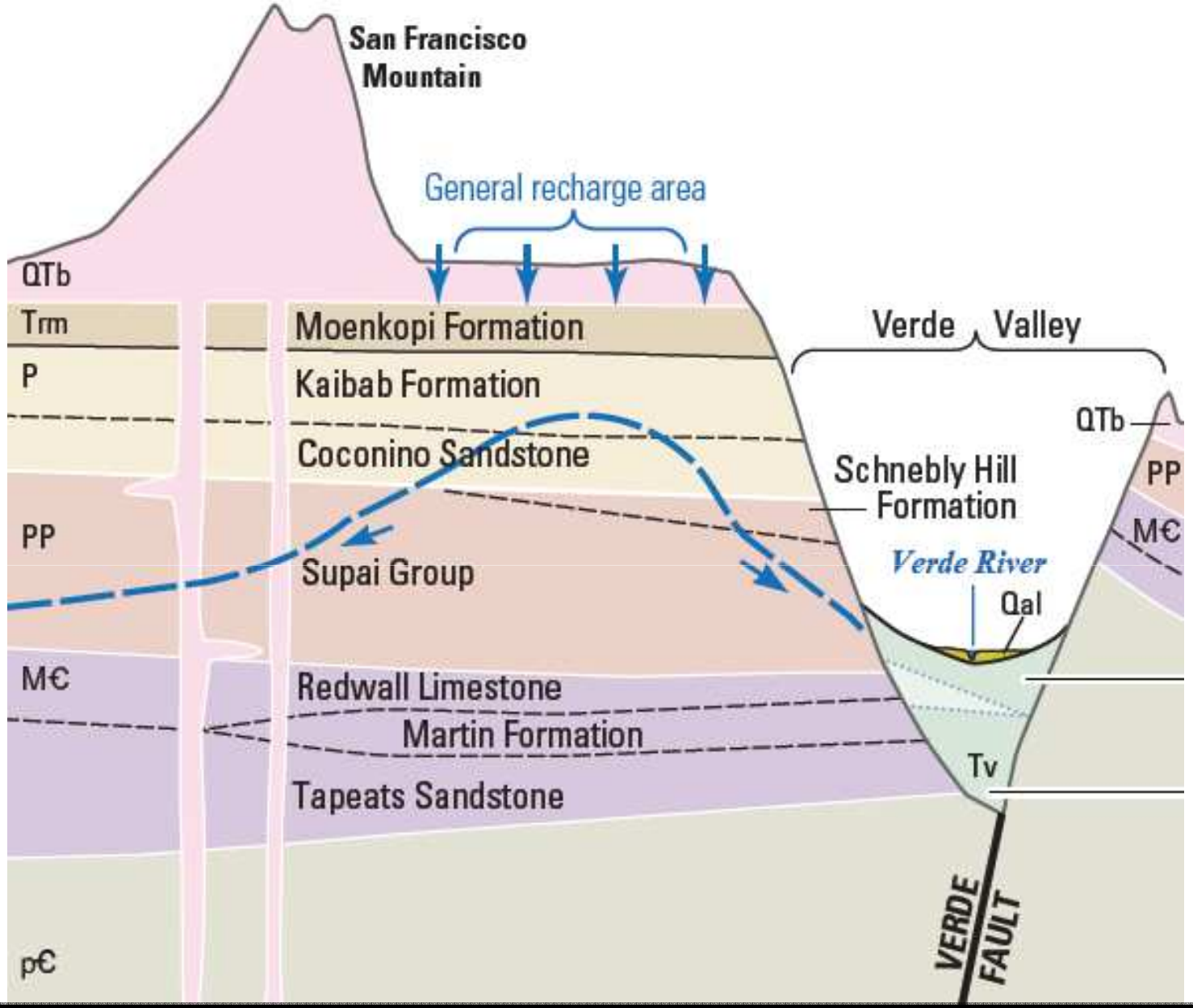


Flagstaff Water Comes From the Deep Rock

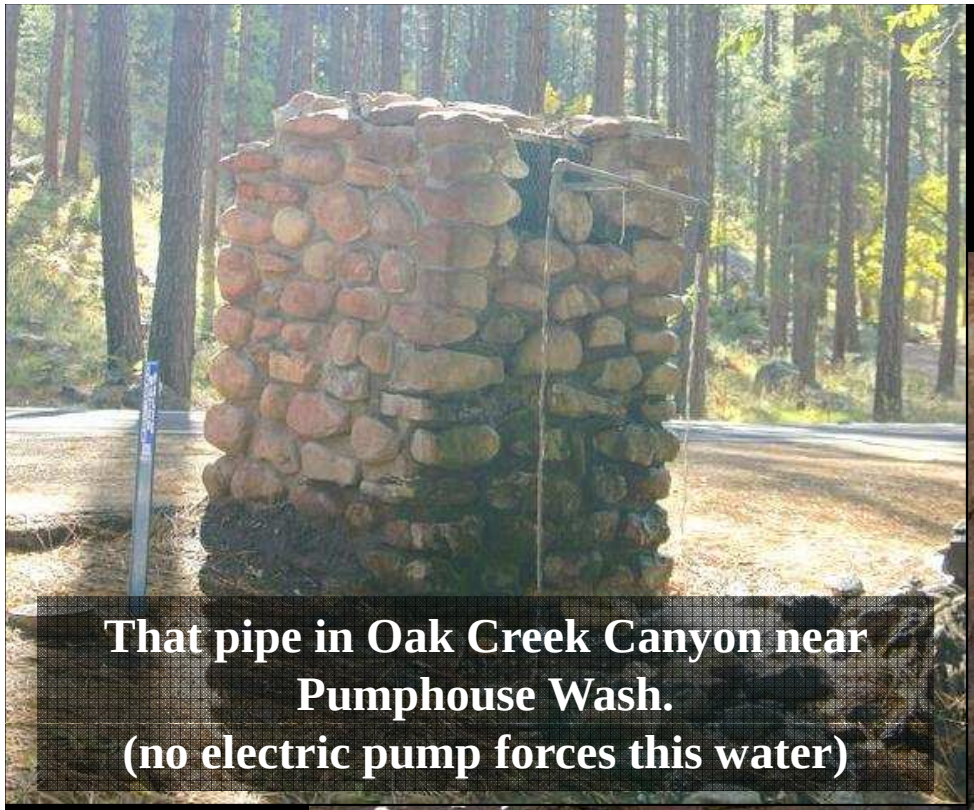
They found it. Wells and pumps. Deep wells.
Nearly as deep into the ground as Mount Elden (in the background) is tall.



Remember the colander. The ground beneath Flagstaff is full of holes.
Holes in the rock. Holes between grains of sand.
These rocks are in fact much the same as those seen exposed in the Grand Canyon.



All water in these rocks MOVES from one place to another. Not some of it; all of it. As in the Inner Basin, it moves from areas of high pressure (recharge areas) to areas of low pressure—springs.



That pipe in Oak Creek Canyon near Pumphouse Wash.
(no electric pump forces this water)

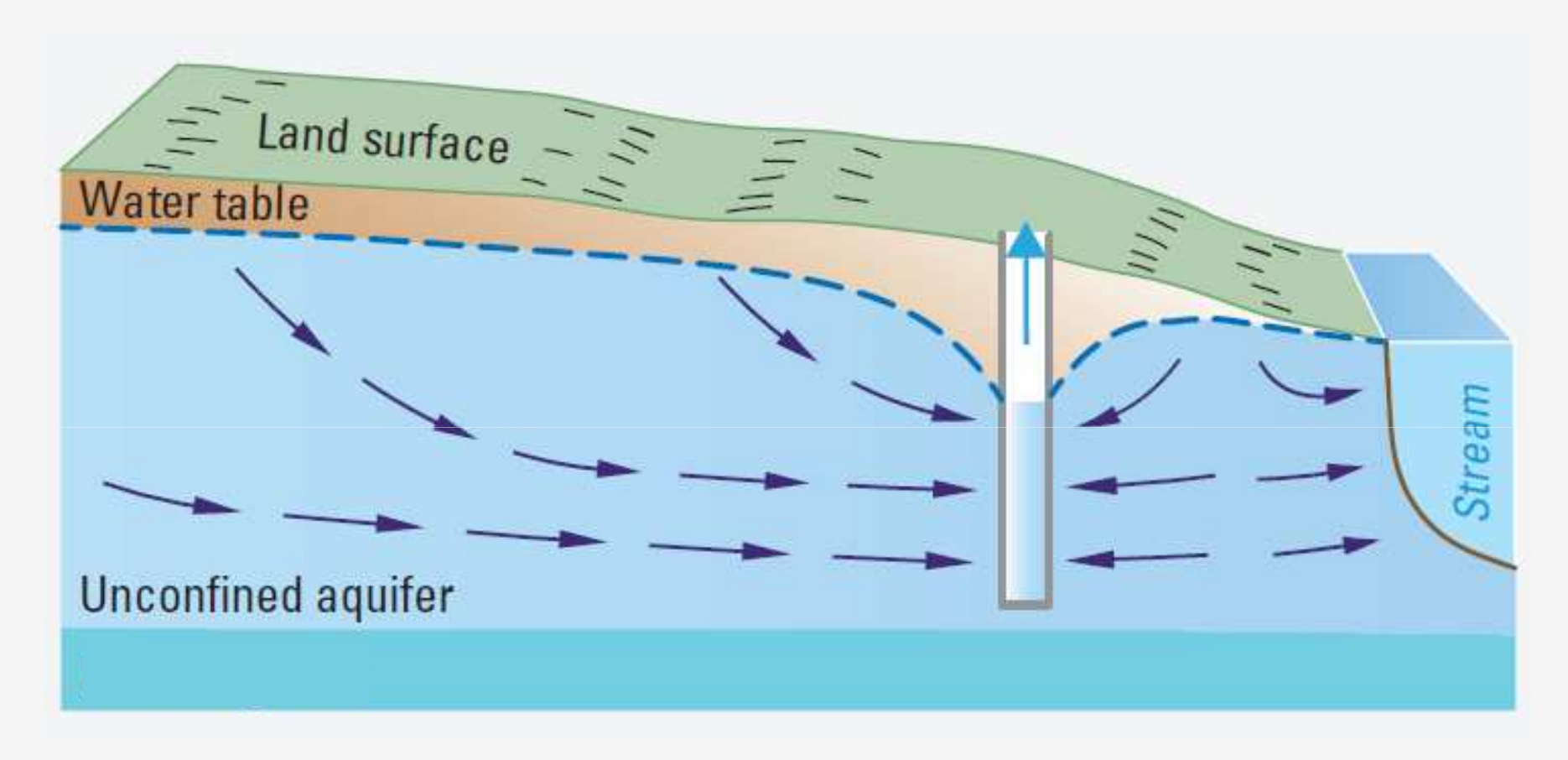
Beautiful Blue Spring of the Little Colorado River;
so large that, in about an hour, it discharges
the same amount of water Flagstaff uses in an entire day.

Credit: Don Bills

Some springs from these deep rocks are well known.

But it isn't practical to build a pipe from Blue Spring to Flagstaff.
So well were drilled to intercept—short circuit—the water in the ground that otherwise eventually would have discharged at these springs.

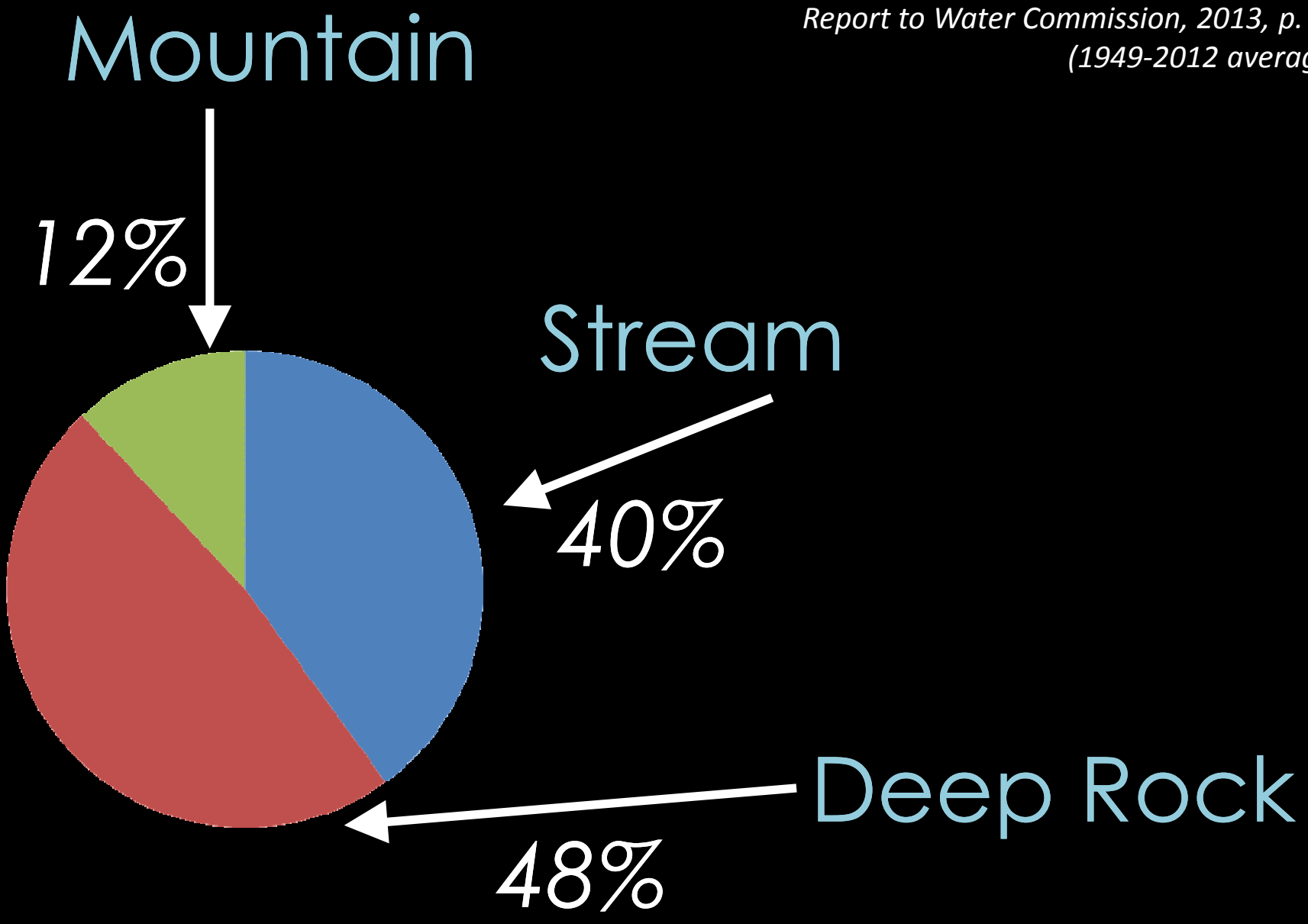
These are deep, multi-million dollar productions; not quaint hand-dug wells!



Humans, through their intelligence and decisions have CHANGED the natural system. Water that once was destined to discharge at a spring won't get to where it was going.

I*f moving groundwater is taken out, it won't get to where it was going.*

Source:
Report to Water Commission, 2013, p. 17
(1949-2012 average)



Flagstaff water comes from the mountain, stream, and deep rock—
over the long term, in about these proportions (they vary year to year).

Credit: Tom Bean c/o FoRio

Now possessed of this knowledge, may you share it.
Now possessed of this scientific knowledge, may we all be better natural stewards.