

May 5, 1923.

Memorandum for Mr. Judd:

As you remember, we did a little flood investigation when I was there last September. We accomplished very little as the bark on the trees seemed to be filled with wind-blown sand instead of flood sand. Since last September I have determined the approximate date of the great flood that I had found traces of at Reflector Bar. This flood occurred about 1856 instead of 1820, as previously estimated. The discharge at the Power Camp was about 125,000 second-feet instead of the 100,000 and 105,000 second-feet previously estimated. The increase in discharge is due to the discovery that there is a shift in stage-discharge relation for large floods at Reflector Bar, also to finding that the flood was slightly higher than previously found.

Since my visit in September I found at The Dalles near Concrete that there was a larger flood than the 1856 flood - the flood of Indian tradition that occurred about 1820 may have been the one that reached that stage. It is likely, however, that several extreme floods have reached approximately that height in the last few thousand years. I presume such floods had a discharge of somewhere between 150,000 and 200,000 second-feet at the Power Camp. I am very anxious to obtain some data on this extreme flood at the Power Camp in order that I may complete a flood report I am now making. When looking for flood data at the Power Camp, I was much struck by the very small amount of soil over the stream-worn stones on the bar or bench where the camp is located. I knew that the 1856 flood should not have covered the bench or bar. I did not, therefore, obtain any data concerning the elevation or slope of the bench. The knowledge that there was a still greater flood than the 1856 flood brings up the possibility that this bench or bar was deeply covered by water in the extreme floods and the surface soil is either scoured off or the bar goes out entirely. If the bar does go out, of course it is reformed at the end of each of these great floods. The following information in regard to the bench at the Power Camp will be valuable:

1. Elevation of bench at the staff gage.
2. Amount of soil on the bench when bench was first cleared to make the camp, in comparison with present conditions, i. e., whether wind has removed the coat of soil over the stones and gravel.
3. Slope of bench down stream.

4. Cross-section of ground surface of bench at the gage (perpendicular to direction of current in the river).

5. Age of oldest trees on bench. This can be determined by counting rings on stumps of trees that were cut at a known time. If these trees are very old and of various ages, say 400 to 700 years, it would show that the bar has remained in place since the oldest tree started its growth. If, however, the oldest trees are fairly young, say 100, 200, or 300 years old, and are all of practically the same age (within 4 or 5 years) the inference would be that the bar went out a few years prior to the time the trees started growing. Of course, a fire might destroy all the trees and a new growth start at one time. If so, however, there should be a great amount of charcoal remaining from the great fire. If no stumps are available for counting rings, one or two of the oldest trees now standing on the bank by the Camp could be cut down and the rings counted. These should, of course, be cut on the Camp side of the river for the trees on the other side possibly did not wash out in any flood.

6. Maximum elevation of flood sand. This sand can possibly be found deposited on the ground surface at some point where there was still water or an eddy. A small cove in the canyon wall would be a good place to find the maximum sand. The elevation of the maximum sand should be about as much above the 1856 flood as the 1856 flood was above the 1921 flood. As I remember it, the 1856 flood reached an elevation of about 903. You doubtless have the figures for 1921.

The main difficulty will be in distinguishing between flood sand and sand formed from decomposed rock. The distinctive features are as follows:

Sand from decomposed rock

1. Light in weight.
2. Sharp corners, rough and gritty.

Flood sand

1. Heavy.
2. Round and smooth.

The better method in searching for maximum flood sand is to go higher than it will occur and gradually work down to it. Quite often the change in material is quite pronounced when using this method. Very likely the flood sand is covered in all cases by wind-blown sand from decomposed rock. If possible, the flood sand should be found as nearly as possible opposite the staff gage. If this is not possible, the location where it is found should be tied in for a distance up or down stream from the gage.

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If you are unable to obtain any other data, I would at least appreciate your giving me the elevation of the bench at the gage and the slope of the bench down stream.

JEM/BB