Pedal, Paddle and Hike

By Trent Carbaugh

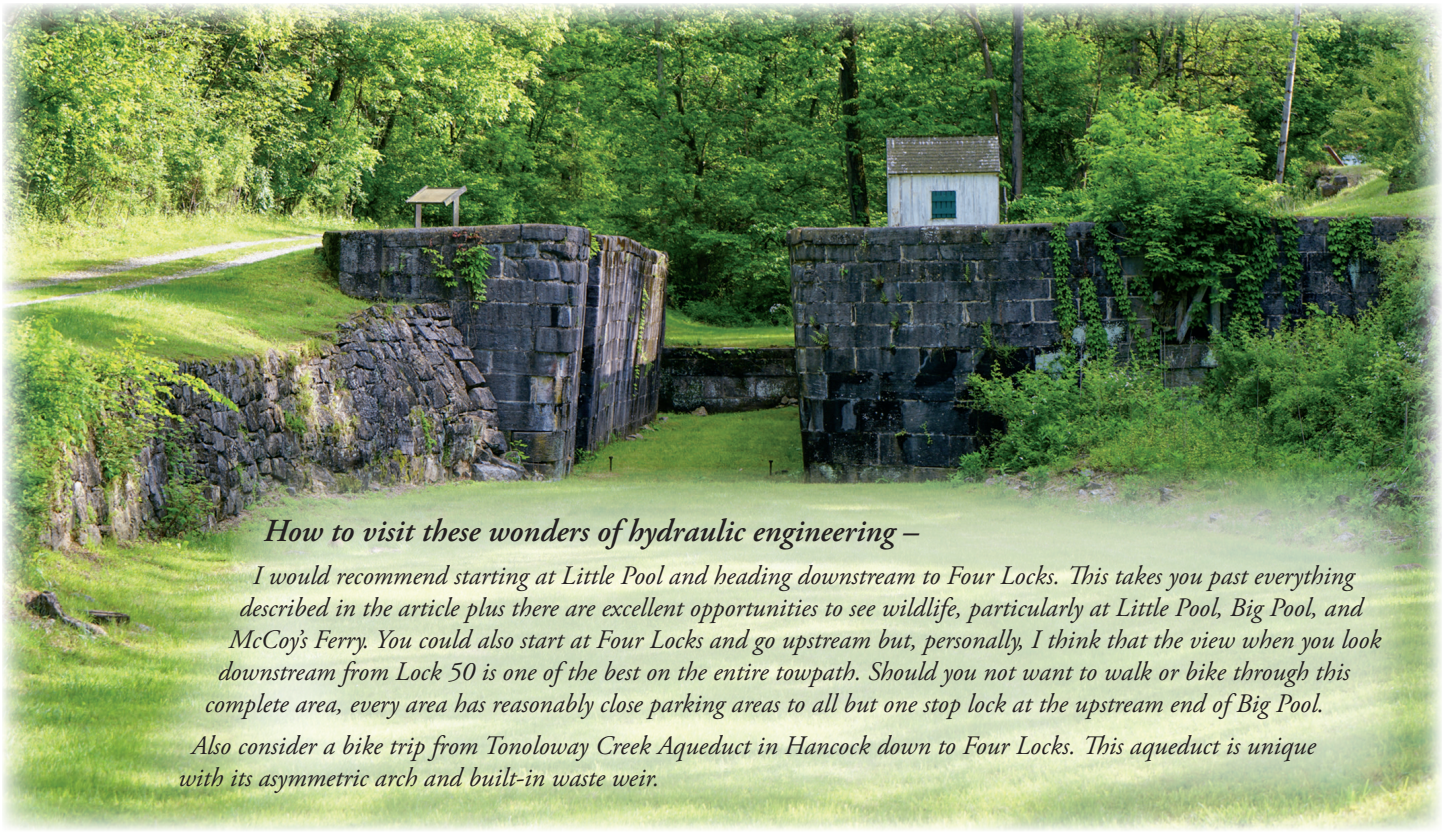
How to Save Water and Fix a Broken Canal
Or
The Perils of Geology

In days of yore our ancestors believed movements of the earth were caused by dragons, dwarfs, or other subterranean creatures either with nefarious intent or by pure accident. In our somewhat more enlightened time, we know that nature's universal solvent, water, is the most likely culprit, at least in a localized context. When we get to the global scale, earth movement is most often caused by tectonic plate movement or volcanic activity. As this massive and long-term process involves fire, dragons *may* possibly be involved. We can only hope.

Dragons aside, we shall concern ourselves with the process that the engineers and builders of the C&O Canal devised to make it easier to both save water and make repairs. The Potomac River watershed has diverse geology that caused problems for the engineers and workers who built the C&O Canal. Materials were for the most part sourced locally in many areas that had excellent stone for building, while other localities did not have the quality of stone that was needed. This caused some very creative thinking and improvisation at times along with improved repairs as time went on. But this diverse geology had other implications as we shall see below.

Canals need water to operate and they are kind of pointless if you can't manage water in a consistent way. From Cumberland to Georgetown the Potomac River drops a significant amount, and for canals to work they must be as level as possible. With 74 lift locks the C&O drops 605 feet. It is an incredible feat of engineering that not only did the canal work, it worked very well. The system of stop locks, lift locks, flood gates, etc. allowed not only mechanisms for normal operations but allowed improvisation during emergencies.

One of the best areas to see how this process worked is the section of the canal from Little Pool to Four Locks. This area has the reservoirs of Little Pool and Big Pool that held water after the canal's winter draining and sped up the spring refilling. Unfortunately, the local geology didn't cooperate at times. Just downstream of McCoys Ferry the local underlying stone changes from hard sandstone to limestone. Limestone is a fine building stone. It cuts into blocks well and is dimensionally stable. This is why so many canal structures were



How to visit these wonders of hydraulic engineering –

I would recommend starting at Little Pool and heading downstream to Four Locks. This takes you past everything described in the article plus there are excellent opportunities to see wildlife, particularly at Little Pool, Big Pool, and McCoy's Ferry. You could also start at Four Locks and go upstream but, personally, I think that the view when you look downstream from Lock 50 is one of the best on the entire towpath. Should you not want to walk or bike through this complete area, every area has reasonably close parking areas to all but one stop lock at the upstream end of Big Pool.

Also consider a bike trip from Tonoloway Creek Aqueduct in Hancock down to Four Locks. This aqueduct is unique with its asymmetric arch and built-in waste weir.

built using it. A problem with limestone is that it is prone to damage, or more precisely, modification from water. This is why we have caves and caverns along parts of the Potomac River.

What this meant for the canal, in some spots, is that sinkholes can form when the underlying limestone structure collapses due to voids caused by underground water flow. This was very bad if it happened in the canal prism. A large sink hole exists in the prism just down from the stop lock at McCoys Ferry.

In order to facilitate ease of repair and interrupt canal traffic as little as possible, some mechanism was needed to isolate smaller sections of the canal in some areas. Stop locks were used to "stop" water movement in the canal prism. Many of these locks were used for water management during the yearly winterization of the canal. But other times it was necessary to block off a section of the canal for repairs, such as at McCoys Ferry. A large sinkhole in the canal prism would be like pulling the plug on a full bathtub; the water would disappear quickly. The stop lock would have been closed along with the upstream gate of Lock 50, the uppermost lock at Four Locks, and the waste weir just above Lock 50 would have been opened to drain this section of the canal in order to do needed repairs.

Stop gate at McCoy's Ferry – All photos by Trent Carbaugh

Stop gate at the western end of Big Pool

Many stop locks on the C&O Canal were closed with plank "gates" where heavy boards were slid into slots built into either side of the lock walls. These boards were probably quite wide and judging by the width of the slots at least 2½ to 2¾ inches thick. Most likely some sort of portable winch system was used to place and remove the boards though I could not locate any information on this. Plank gates were probably preferred as they weren't used very often and wouldn't require the regular maintenance that normal miter or drop gates required.

Two unique features in this section of the canal were Big Pool and Little Pool. These man-made lakes served as water reservoirs for a large portion of the canal and could be closed off during the winter. Big Pool had a stop lock with a drop gate and presumably the machinery to open and close it. This stop lock also has slots for a plank gate which may be an addition as it is from a later 19th century concrete repair to the lock chamber. A double lock may also have been prudent as Big Pool was left full over the winter and froze to a thickness

A view of the Big Pool western stop gate plank slot

Plank slot in a stop gate

Stop gate at east end of Big Pool. There was a drop gate here as well as the mounting foundations for a swing bridge. The swing bridge remains are at the west end of the gate.

that could have been problematic for the lock gates due to the pressure from expanding ice.

At the far upstream end of Big Pool there is another stop lock of more conventional construction with slots for plank gates. Unfortunately, this stop lock is not in great shape and shows extensive historic repairs.

At the downstream end of Little Pool there is a stop lock, almost exactly like the one at McCoys Ferry, that has slots for a plank gate. This stop lock is built a little downstream from the end of Little Pool quite likely again as protection from ice expansion. Little Pool is substantially smaller as well as shallower than Big Pool.

It's easy to get onto the towpath on foot or on a bike and not notice some of the infrastructure that made the canal work. Granted, often the wonderfully riotous efforts of nature obscure some of the works of man, but to me that just makes it more interesting to look for them. You never know what you might find.

References:

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Geology of the Chesapeake and Ohio Canal National Historical Park and Potomac River Corridor, District of Columbia, Maryland, West Virginia, and Virginia, 2008, USGS Professional Paper 1691, S. Southworth, D. Brezinski, R. Orndorff, J. Repetski, and D. Denenny.

Sinkhole in the canal prism close to McCoy's Ferry

Butterfly gates in the waste weir above Lock 50 at Four Locks

Waste weir above Lock 50 at Four Locks