San Juan River Silt Story - 1994

Reference **Stevenson, Gene and Don Baars, 9/94, Paiute Falls, Lake Powell, Utah *in* The Canyon Echo, vol 1, 8th Ed., p.4, 5 & 13.**

HOW IT WAS

By the time the Colorado River is joined by the San Juan, it is a sizeable river with many tributaries (see map) of greater or equal size. What makes the San Juan stand out is its position in the sequence, and its load of sediment. For its size, it packs a huge volume of silt and mud. This is due to it picking up huge drainage basins of arid plateau country, that when they flash, can create huge torrents of screaming red muddy waters.

Lake Powell, located in southeastern Utah, drowns a portion of the Colorado River and the lower segment of the San Juan River (Fig. 1). As overall lake level dropped from 1988 through 1994, a major waterfall formed on the lower San Juan River below the Clay Hills BLM boat ramp. The waterfall had been widely publicized by river-runners, but most everyone else had either ignored its presence, or still assumed that the San Juan continued to flow quietly unimpeded into Lake Powell. Nothing could have been farther from the truth.

Certainly, one big reason to not publicize a waterfall on Lake Powell is that it is clear proof of man and bureaucracy's failed attempts to control nature. The roar of Paiute Falls speaks loudly and clearly to those who will listen - about an ecosystem that is endangered by mankind's quest for dominion. Besides creating ecological nightmares, the damming of high-gradient, silt-laden streams and rivers in the Southwest have been called a "mistake waiting to happen."

Around the world, waterfalls are usually highly regarded scenic masterpieces of nature, and what could be more appropriate than to include a year-round waterfall on beautiful Lake Powell? This lake is the result of the construction of Glen Canyon Dam, completed in 1963 and built to control the Colorado River and to alleviate flooding downstream. It was also built to provide guaranteed volumes of water to California-Nevada-Arizona, hydro-electric was thought to be a major plus as other "cash register dams" were promoted by BurRec, and of course it was built and filled unexcelled recreational opportunities for the masses who would otherwise have been deprived of the joys of spectacular Glen Canyon in its natural state.

HISTORY

As the population and development of agriculture mushroomed in southern California and southern Arizona, government survey expeditions were launched in the 1920s in the search for potential dam sites along the mighty Colorado and its major tributaries so that the raging river

could be “tamed” and the water impounded for “beneficial use.” The Green and Colorado rivers were surveyed in 1922 in association with a San Juan River survey the same year - the Marble and Grand Canyon survey followed in 1923. The first dam - Hoover Dam - was completed the next decade in Black Canyon near Las Vegas, Nevada. Someone soon noticed that Lake Mead, the resulting reservoir, was rapidly filling with silt and sand carried down in copious amounts from the Colorado River drainage basin above. In spite of the well-advertised reasons for the necessity of a second dam upstream, Glen Canyon Dam would be required to halt the influx of sediments and the consequent early demise of the Hoover Dam engineering marvel. Certainly, a second dam, if constructed upstream in time, would mitigate the problem at Mead reservoir, and besides, who would ever miss the remote, narrow, rock-barren Glen Canyon?

The canyon “no one knew” began to be engulfed in 1963, its archaeological and scenic treasures drowned forever. It took only two decades and two back-to-back winters of record snowfall in the Rocky Mountains to fill Powell reservoir behind Glen Canyon Dam to its maximum elevation of 3,711 ft above sea level, a level only attained in June, 1984. The result was that Glen Canyon Dam overflowed and the spillways were nearly destroyed (Hannon, 1996). Lake water lapped at the foot of Big Drop Rapid in Cataract Canyon on the Colorado, Grand Gulch Rapid on the San Juan River was inundated, and powerboats could now cruise underneath the previously seldom-seen Rainbow Bridge. Hundreds of miles of drowned river canyons now clearly demonstrated the success of recreational fulfillment by hoards of power boaters and water skiers in the otherwise inaccessible canyons. The unadvertised real reason for building the dam - the cessation of sedimentary infill of Mead reservoir - had also been successfully achieved. Or had it?

Where would all those cubic miles of sediments carried down the eroding Rocky Mountains and Colorado Plateau come to rest? Once again, Glen Canyon Dam and Powell reservoir came to the rescue. And besides, who would notice? The far reaches of the former Glen Canyon were in such desolate and fully isolated canyons that it mattered little as to their demise. The reservoir was so long, hundreds of miles long, that the lake bed would never be filled with silt; never become vast cornfields for the benefit of local Indian tribes; never crowd the storage capacity of such a marvelous engineering dynamo.

Unexpectedly, even to the water-hungry masterminds of the first half of the twentieth century, river-running came into vogue. Then people, by the tens-of-thousands, began floating the rivers of the American West. Throngs of river-runners invaded the canyons like locusts. They noticed! They saw flat water, teaming with water skiers and houseboats, where wild rivers had once been. They fought the tortuous meandering channel ways through mudflats where some of the most exciting rapids had been feared and recorded by early explorers. They yearned for the marvelous spiritual experiences of Glen Canyon enjoyed by John Wesley Powell in 1869 and brought to life by the other fortunate few people, like the photo essays of Elliott Porter, or

Katie Lee, or Kent Frost. They cursed the mud-drenched canyons and quagmires where boats must be retrieved at journey's end. They were not sympathetic with "the great recreational facilities" provided by the dam builders.

THE SAN JUAN RIVER

The headwaters of the San Juan River lie in the high San Juan Mountains of southwestern Colorado, near Wolf Creek Pass. Water from the upper basin and several tributaries are temporarily stored in Navajo Reservoir, located on the Colorado - New Mexico border (Fig. 1). From Navajo dam, the San Juan River flows unimpeded across northwestern New Mexico and into southeastern Utah where it finally converges with the Colorado River near the Arizona border in what is now Powell reservoir (Fig.1).

On its course below Navajo dam, the San Juan picks up and carries enormous amounts of suspended and bottom-load sediments. For its size, the San Juan carries comparatively more sediment than any other major tributary to the Colorado River. The source of most of these sediments is from overgrazed plateau lands of the Four Corners Region. Spring runoff and late summer rains can rapidly change the San Juan from a docile stream to a seething torrent of mud.

Today, the San Juan River is popular for nearly 15,000 combined commercial and private recreational boating enthusiasts, annually. The most scenic stretch of river is from Sand Island Recreational area west of Bluff to Clay Hills Crossing, a distance of nearly 84 miles (Fig.2). Approximately nine miles west of the Sand Island launch site, the river leaves its lazy meandering course and flows through deep limestone canyons incised into the Monument Upwarp (Fig. 3). The San Juan cuts across the structural axis of the Monument Upwarp as an incised river superimposed on the west flank of the Monument Upwarp. After being confined by a thousand-foot deep canyon for nearly 60 miles, the high gradient, silt-laden river enters the placid waters of Powell reservoir. And not surprisingly, it is there where nature is at odds with the "achievements" of man.

HISTORY OF THE LOWER SAN JUAN RIVER SILTATION RATE

The decision to build another dam above Mead reservoir was based, primarily, on the

tremendous rate at which this reservoir was silting-in. After exhaustive political efforts had failed to permit construction of dams in Grand and Marble canyons, the U. S. Bureau of Reclamation constructed Glen Canyon Dam near the Utah - Arizona border (Fig. 1). Lake Powell began to fill in 1963 and power generation began in 1964. By 1980 the reservoir had filled to a sufficient height to finally test the spillways for the first time. The miscalculation (and overall lack of judgment) of the spring runoff of 1984 nearly wiped out the spillways as the average lake level reached an elevation of 3,711 ft asl (above sea level). But, the dam held and the lake level was maintained at an average high-pool elevation of 3,700 ft above sea level until the summer of 1988. (For more, see Hannon, 1996; Bur Rec tape, Reisner?)

Moderate to dry winters from 1988 to 1996 (?), accompanied with increasing downstream demand, resulted in a low point of 3,519 ft asl in mid-1992 (confirmed by aerial observation of lake level at RM 100.2). **By June, 1994 the lake level rose to nearly 3668 ft asl**. Current lake level is **3677 ft asl** as of 4/11/00.

This fluctuation in lake level of 192 ft (?) over the past 15 years has certainly left its mark on the upper reaches of the San Juan arm of Powell reservoir by, first completely filling it with a wedge of silt, then exposing vast silt flats grown thick with non-indigenous "exotics" (like tamarisks, tumble weed, knap weed, etc.) resulting in a major "re-routing" of the San Juan River, followed by another inundation of rising slack water as Powell reservoir once again filled to 3675' as of 11/30/00. The resulting fluctuations have created an artificial "riparian" biological community and a huge man-made flume in which fluvio-deltaic geologic and geomorphologic processes can be observed.

Just below Slickhorn Gulch (at river mile 66.7) is the first indication of lake-induced silt bars, marking the high water level of 3,711 ft asl of 1984 (actual silt line at 3715-20 ft ? suggesting river was "stacked" due to sudden change in gradient; aka suck-hole alley). For the next 16.6 miles to Clay Hills, the river now drops at a rate of only 0.42 ft per mile where it used to flow naturally at nearly 5 ft per mile. Even though the highest lake level in recent years **(1994 of 3668', and current level of 3677')** is some **32 to 23 ft lower than the boat ramp at Clay Hills**, this section of the San Juan River maintains this sluggish meandering rate. Common sense and a little arithmetic should tell us that this section should have, by now, re-established its old gradient as the lake level dropped nearly 200 ft!! After all, uncompacted layers of silt sand and clay was all that had filled-in the 85 feet of lost gradient. What could have held back all the silt?

ENTER WATERFALL, 1988 - 1997 (?)

Clay Hills crossing is located at the mouth of the west-plunging sandstone and limestone

canyons in which the San Juan has cut for some 57 river miles upstream. Immediately below Clay Hills crossing, the countryside "opens-up" briefly, for about 5 miles, before flowing into the narrow sandstone -rimmed Glen Canyon (see map). Here, the river widened into a brief stretch of low-gradient, braided stream whereby much of its sediment load was dropped, forming a widened flood plain named Paiute Farms. At high lake levels, silt was deposited evenly across the area and extended nearly 19 miles upstream to Slickhorn Gulch. The high-gradient, silt-laden river was forced to give up its suspended and bottom-load sediments to the artificially calm waters of the lake. During the mid 1980s highstand, all low-relief topography less than 3,711 ft asl was buried by lake silt, creating a rather uniform profile of the lake bottom. As the river's gradient was reduced by the silting-in process, the river's energy slowed dramatically such that the sluggish and aimless meandering currents lost their way across the man-made delta, dividing into numerous distributary channels only inches deep.

As the lake level began to lower in 1988, the river currents shifted slightly to the north to cross the delta, flowing across the buried red rock cliffs. (see photo- lake sediments, bedrock, waterfall). The river current became trapped in the deltaic lake silt as the lake level continued to drop, and cut downward to the buried bedrock, forming a "surprise" rapid by year's end. By late 1990, "Paiute Falls Rapid" as it had become known to us river guides, had become a formidable obstacle, such that no one but the foolish attempted running it. With continued lowering of Powell reservoir, the rapid matured into a sheer waterfall that became a curiosity to many, and an embarrassment to the dam builders and lake enthusiasts. The U.S. Dept. of Fish and Game were certainly aware of it, as fish migration from lake to river environments was now severed.

For at least a six year period (1989-1995), an unrunnable waterfall blocked navigation 2.2 miles below Clay Hills boat landing. Although short-lived, this was the biggest "rapid" on any so-called navigable stretch of river in North America, and no one knew about it. News of the waterfall still remained a local curiosity until **1993**, when I finally managed to get a Salt Lake City television news crew to helicopter out to the brink of the falls and see for themselves. They were impressed. I was interviewed, and when asked how this problem could be prevented, I replied ***"don't build dams on high-gradient silt-laden streams without having a solution for the cubic miles of sediments that will accumulate."*** The news piece aired at 5:00 pm the following afternoon, and was supposed to air in more detail on the 10:00 pm "late" news. It never showed. The TV station manager considered it too hot a topic, and shed unsatisfactory information on a much beloved Utah recreation site. Bur Rec representatives I contacted during these years were either uninterested to discuss the situation, or claimed ignorance that the waterfall was a rumor - it didn't exist. In the meantime, two clueless boaters from Farmington, NM went over the falls; they were rescued but their boat was never recovered. *The NPS finally erected a warning sign at the Clay Hills ramp in 1995, after the near fatal accident*.

During this entire five year period, the top of the falls was only 9 ft lower than the 1984 high lake level of 3,711 ft asl. The base of the waterfall was some 26 to 35 ft lower (depending on the lake level). The original course of the river flowed past a series of low-relief ledges of red rock (Organ Rock Shale of Permian age) along the right-hand (north) valley wall, and headed almost directly southward toward Paiute Farms. Following the high water years of 1983-84, a Navajo-operated marina, complete with concrete ramp, had been constructed at this uppermost reach of Lake Powell, and alongside the drowned mouth of Paiute wash, a dry wash. The life of the Paiute Farms Marina was very short, as it was immediately plagued with encroaching silt problems as lake levels in the late 1980s fell. We river runners enjoyed it those years, making a takeout pleasant, what with paved landings, and ice cream in the store. **But a late summer flash flood in 1990** sealed the marina's fate, as the shallow embayment was completely filled in by this one, rather average, and predictable flash down Paiute wash.

Trapped in the new channel, astride the exhumed rock ledge, the waterfall formed a temporary nick point, or perched base level of erosion. Lake sediments trapped in the 19 miles of canyon above the waterfall had been artificially suspended in the system at a level that ranged annually some 25 to 50 ft above the 1994 base level of Lake Powell. The seasonal fluctuation combined with the overall lowering of the lake had accelerated the formation of yet another delta complex downstream of that held up by Paiute Falls. By the fall of 1994, nearly 40 miles of the San Juan river corridor had been silted-in with downstream progradation of the delta continuing today.

1994 course - almost breached the falls

by 1996/97 - lake level rose, inundated and covered the falls - the BurRec was saved.
1998- once again river trips took out at Paiute landing (now re-claimed) no more concrete ramp; no more ice cream.
1999- unstable delta front sediments and multitudes of narrow distributaries make crossing the delta front very dangerous.
2000- no data; waiting on runoff

CONCLUSION

Even though the siltation rate was a major factor in the construction of another dam upstream of Hoover Dam, when Glen Canyon Dam was built there was no apparent consideration given to the huge volume of silt that would be deposited at the lake/river interface on the Colorado and San Juan Rivers. No consideration whatsoever was given to the sediment-starved beaches that would develop downstream in Marble and Grand Canyon's. Least studied

were the marinas located at the upper reaches of the lake; those necessary for the recreational objectives of the project; those that would be progressively silted-out such that continuous abandonment would be the only viable solution. Obviously, no consideration was given to drastically altered stream courses, the safety hazards that would result, nor of major ecologic damage that must necessarily follow.

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