Field Review of Sammamish River Weir & Transition Zone – September 2011

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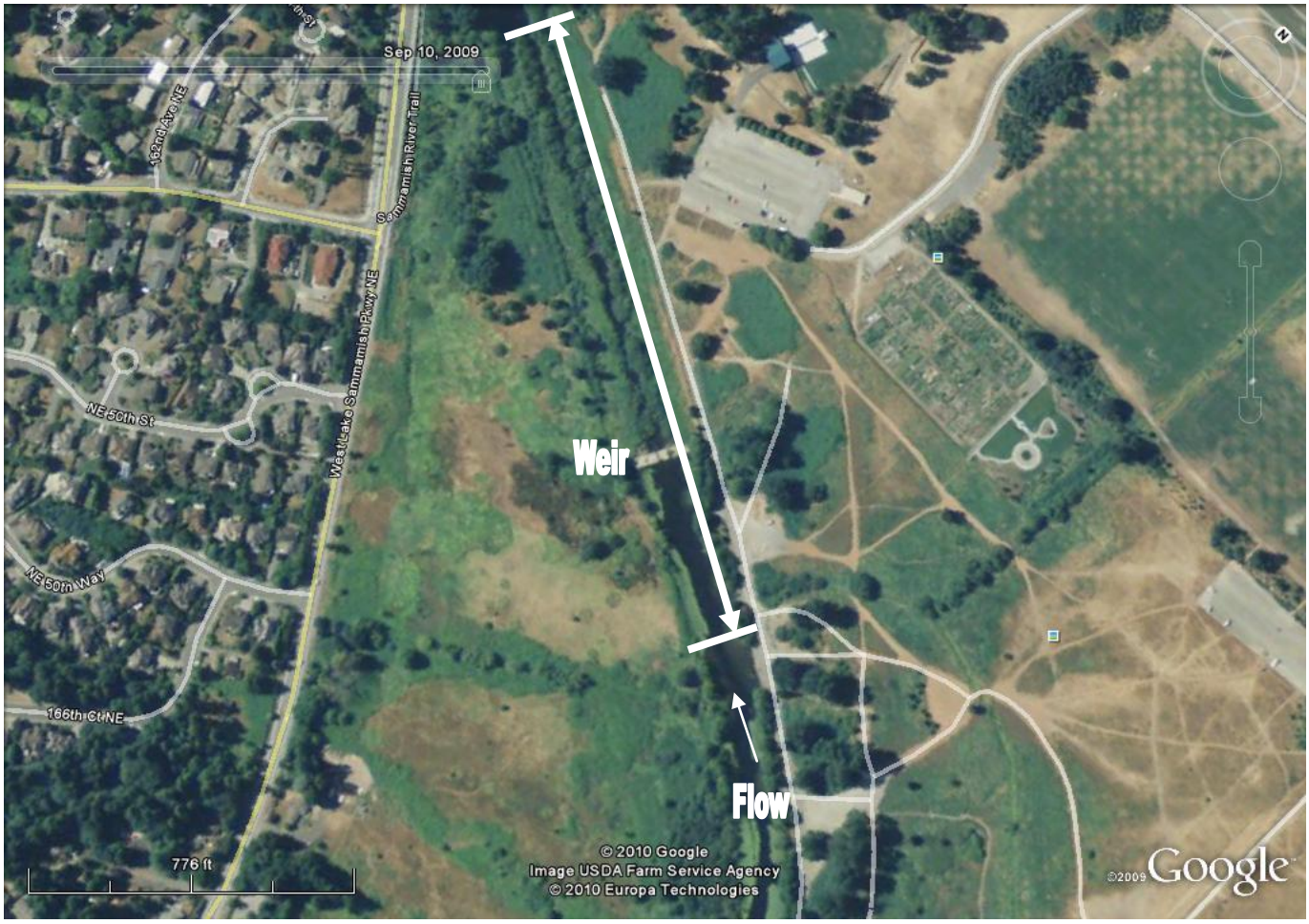
On Wed. Sept 28th, 2011 I and several others visited the weir and transition zone on the Sammamish River located adjacent to Marymoor Park. The purpose of the visit was to observe conditions at the conclusion of maintenance efforts being conducted by King County. I was accompanied by Lake Sammamish resident Dr. Gil Pauley and a hydrologist. This visit commenced about 10AM.

General Observations

Observations were made from atop the east channel bank in the off-leash dog area of the park extending from several hundred yards upstream (lake-ward) of the weir some 1600 feet to the north end of the transition zone prior to its terminus as shown in the following photo.



County crews were noted entering and leaving the channel area in the vicinity of the weir. They appeared to be completing brush cutting activity and cuttings from their efforts were visible along the fenced edges of the channel's upper bank. (See next photo which was taken at this time.)

East Channel Looking South near Terminus of TZ – Sept. 28th, 2011
(Showing result of channel clearing)

It was apparent that the near (east-side) channel had been cleared of trimmings from the channel proper and that larger willow stems had also been removed. The far channel could be observed on the opposite (west) side, to be similarly cleared. Neither of these outside channels carried flow at this time.

The weir proper, shown below, was slightly submerged. The area below the weir was pooled and it could be noted that the main channel heights were still distinctly higher than the top of the weir as observed in Sept. of 2010.

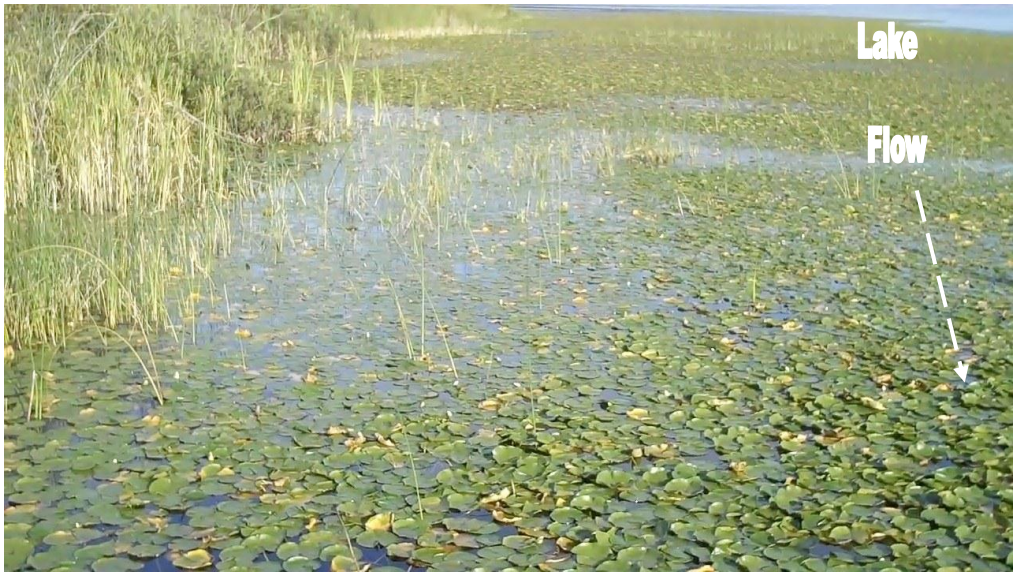
Sammamish River Weir Looking West – Sept. 14, 2011

Of note at the time of this visit were conditions that would affect the flow characteristics of this section of the river. These included: (1) upstream obstructions to flow, (2) obstructions in the center, low-flow channel, and (3) obstructions at the terminus of the transition zone where it should transition to the river proper.

Upstream Obstructions

The area ahead of the weir is important to its ability to pass design level flow. Constraints to flow were observed ahead of the weir including channel narrowing due to reeds, lily pads, tree growth, and woody debris. The following photo was taken approximately 0.5 miles from the weir toward Lake Sammamish.

Sammamish River Headwaters at Lake Sammamish – Sept. 2011



In addition, one or more drainage ditches dump storm water to the river ahead of the weir. The following photo, from a 2007 County document, clearly depicts this issue. A plume of sediment is readily discernible in this photo. It is likely that significant amounts of sediment have accumulated in the river bed, again reducing the cross section available to flow.

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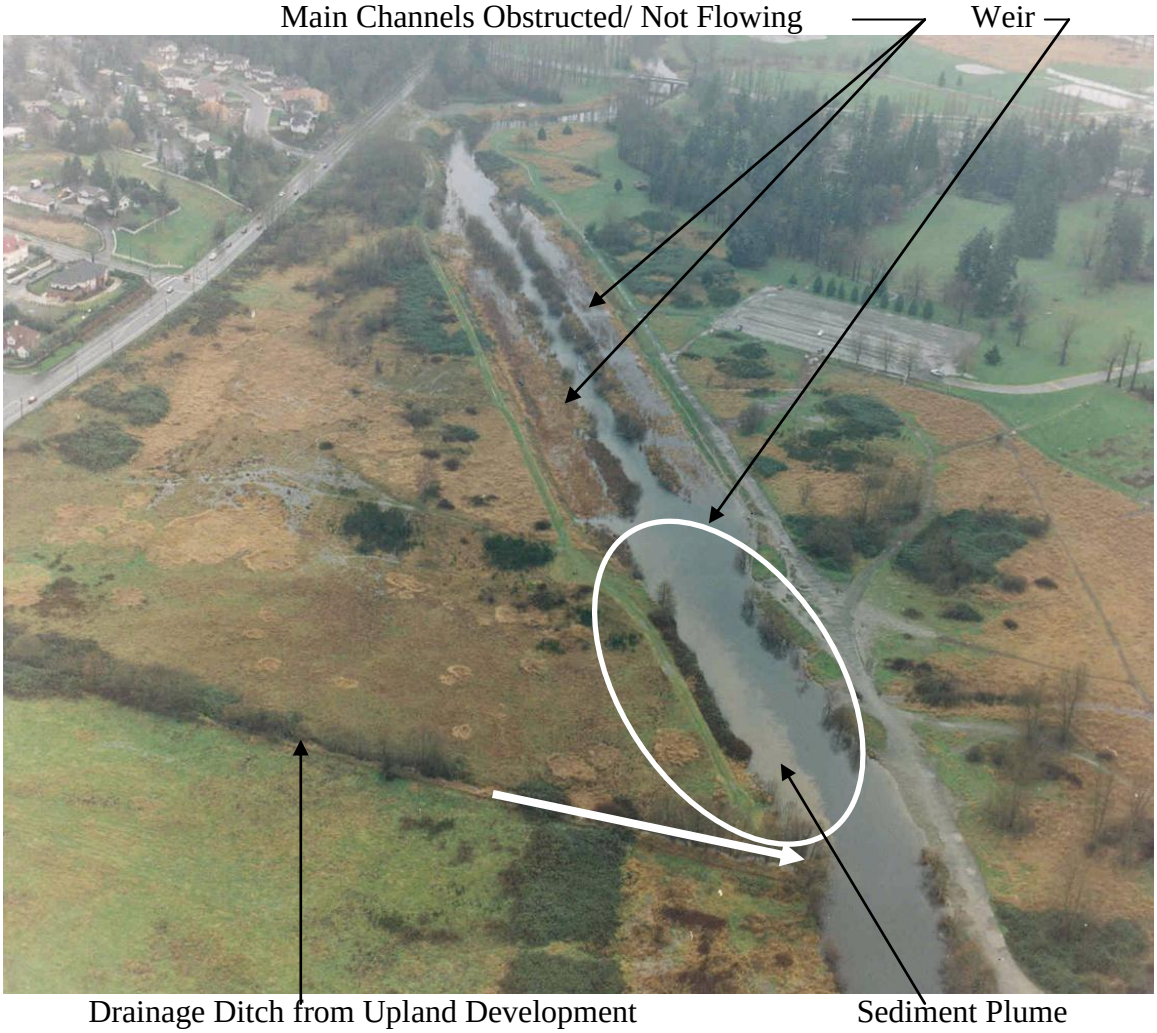
Sammamish River Transition Zone, 2007 Flood Conditions



Transition Zone Obstructions

A number of items impede flow through the transition zone. These include:

- Willow Growth
- Accumulated Low Flow Debris
- Recently Discovered Rock Weir
- Bank Irregularities
- Main Channel Debris
- Trees

The addition of vegetation has been allowed along the edges of the center, low-flow channel. Unfortunately these fast growing plants impede flow. Obviously present for some time, their effect will have been a lowering the original design flow prescribed by the Corps of Engineers. As shown in the following photo of recently extracted growth, in just a few years, willows can grow to a diameter of 6 inches or more. With an extensive root structure, willows will act as a net capturing passing debris, further diminishing flow. Subsequent photos attest to this impact.

Example Willow Growth Removed from TZ – August – Sept. 2011

Willow Snags Impeding Flow

Main Channel Debris Build-up

A rock obstruction was noted in the center, low-flow channel during the field visit. Shown in the following County photo, it too impedes flow. This is demonstrated by the pooling of water upstream of the obstruction. Placement of anything that blocks the flow of the active floodway (especially in-water placement) is typically prohibited without permits and a NMFS determination[1]. It is unclear who placed the rocks or why the rocks were placed in the water of the Sammamish River (in the bed of the active channel) or what permits were issued to allow this placement. This will impact channel flow and ultimately the water levels of Lake Sammamish. This rock obstruction will also impact the navigability of the river. If allowed to remain, it will pose safety risks to unsuspecting boaters.

The impacts of the obstruction can also be subtle. As noted in the photo below, and can be seen in aerial photos of the channel, the channel itself has been altered as water flowing through the area has sought out and cut new routes in the channel embankment. Such irregularities are much less efficient at moving flow. Discussion with County staff reveals the rock used for this small dam may be from the quarry spalls installed by the Corps' original project. Thus, the channel bed may have been compromised.

[1] Upon learning of this rock obstruction, but before the close of their permit window, a request was made of WDFW to allow immediate action to clear the obstruction. This request was denied.

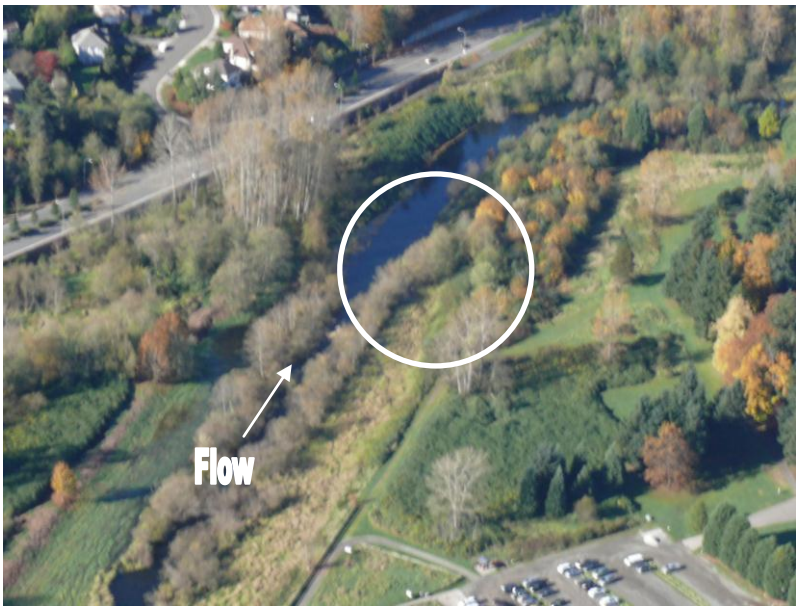
Low Flow Channel Rock Obstruction – Sept. 2011

The main flow channels sit considerably above the center, low-flow channel and the surface of the weir. While crews were observed working to remove cuttings from brushing this season, this has not been the practice for nearly a decade. As a result, debris has accumulated and raised the level of the main channels by several feet.

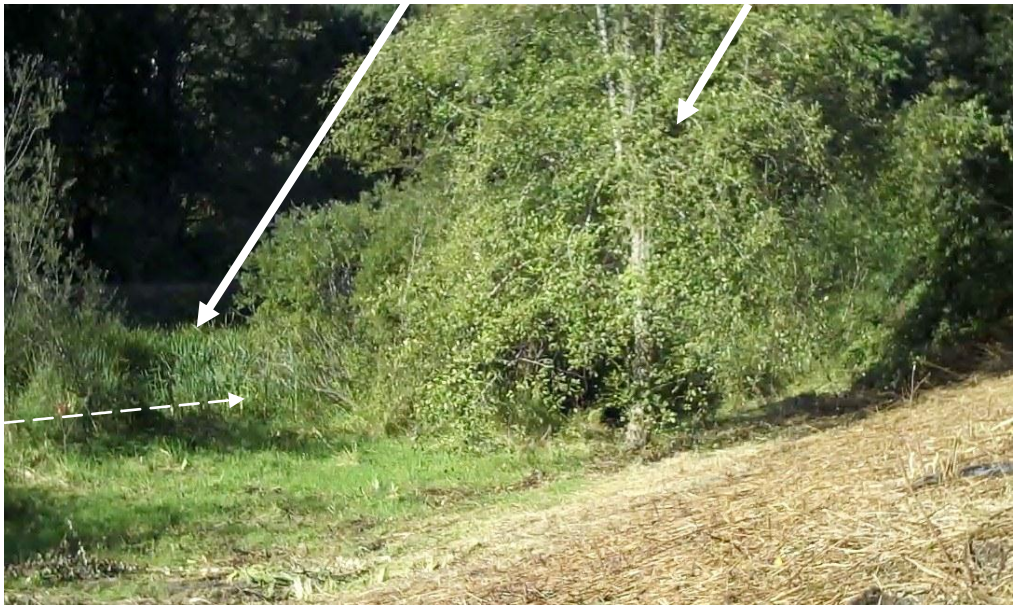
Terminus Obstructions

Further restrictions to flow in the main channels were observed. Trees and restrictive embankments can be observed at the north end of the transition zone. The first photo following identifies this location specifically. The second photo, taken recently, shows at least one large tree at this location. In addition, instead of the high flow channel transitioning smoothly to realign with the river, it actually rises several more feet. Such "pinch points" will present yet another impediment to flow and further increase flood risk to Lake Sammamish shorelines.

North End of Transition Zone – Nov. 2010 (Showing Channel Constriction)



North End of Transition Zone, East Bank Looking North – Sept. 2011
(Showing bank obstructions and tree in channel)



River flows behind bank.

The net effect of these obstructions will be diminished flow. It is not surprising that residents, who've studied the County's flow data through the weir, have reported flow levels less than half that intended by the Corps.

I believe there is an additional complication of the above obstructions. Attempts to analyze flow using computer models will be hampered. Attempts to calibrate these models to reflect impedances to flow will be difficult, costly and their accuracy suspect. For example, it's been hypothesized that Bear Creek, over a mile away and more than 6 feet lower than the weir, is having an effect on the weir water levels. Evaluating the efficacy of this assumption cannot be accurately done without elaborate efforts to calibrate for the myriad obstructions reported here.

Finally, it should be noted that analysis of the river characteristics is but half of the equation needed for a comprehensive approach to Lake Sammamish's flood potential. Effective decision making requires determination of the flows into the lake, not just out of it. Some of these flows are attributable directly to rainfall, some to tributary streams and creeks, but most is likely from municipal runoff. It's the latter that's of serious concern, since it can contain major pollutants if untreated. And, if allowed to increase while allowing reduced capacity to outflow will cause further flooding.

Conclusions and Recommendations

The County has performed the first of several actions promised to lake residents in April 2011. The main flow channels have been cut and raked and the center low flow channel willows have been trimmed. This trimming revealed a small dam of rocks which, according to WDFW may have existed since 2005. It should be removed.

Other efforts to clear the accumulated debris in the main flow channels have not commenced pending a study by the County. Requests to staff for a copy of the study's work program and objectives has not been received. This study should evaluate the effect of the obstructions reported here.

No information has been reported on the means by which the County will monitor return to acceptable levels of flow. Several options have been proposed to County staff. The key need is that monitoring be timely enough to prevent flooding and loss of real property, not simply whether flow levels are "heading back toward design levels".