A PLAUSIBLE EXPLANATION FOR CLARKS CREEK'S CURRENT IMPAIRED CONDITION

Preface

In a previous paper I indicated that iron compounds in Puyallup River valley's water saturated, anoxic (devoid of dissolved oxygen) alluvial soils are the source of iron pollution of Clarks Creek and that iron's dissolution and conveyance to and discharge into Clarks Creek has had an adverse impact on the Creek's native aquatic plant, macroinvertebrate and salmon populations. In this paper I offer a plausible explanation for Clarks Creek's current impaired condition and the appropriate remediation for this condition.

Causative Factors

There are a number of factors that have conspired to caused Clarks Creek's current iron polluted, flooding and degraded salmonid habitat condition. They are: (1) deposition of a thick layer of sand, iron oxyhydroxide, silt and organic matter on Clarks Creek's original stream bed, (2) excessive aquatic plant growth, (3) possible increase in groundwater and/or surface water runoff being discharged into Clarks Creek, and (4) the design, condition and current functioning of the drainage system that discharges iron laden groundwater and surface water runoff directly into Clarks Creek.

Operative Impact of these Factors

Factors (1) through (3) have conspired to reduce the depth and increase the width of Clarks Creek and caused an increase (rise) in the Creek's surface water level that is significantly above that of predevelopment levels. This in turn has raised groundwater levels in the area as a result of what is known as bank storage which is best explained by reference to the illustration and explanation on the next page.

During the early development and build out of the Puyallup River valley drainage ditches were dug (e.g. Meeker Ditch) and drainage tiles and culverts were placed to collect and dispose of wet season surface water flooding of agricultural lands. At that time these ditches, tiles and culverts were located above seasonal high groundwater levels and served the surface water drainage function for which they were intended.

The later advent of Clarks Creek's shoaling as a result of sediment accretion, excessive aquatic plant growth and resultant rise in its surface water elevation has likely caused (via the bank storage phenomenon) a rise in area groundwater levels to the extent that historic above groundwater level dug surface water runoff drainage ditches, tiles and culverts are now below both wet and dry season groundwater levels. Thus the historic surface water drainage system now functions as a perennial groundwater dewatering system upon which periodically is superimposed surface water runoff during precipitation events. This phenomenon was graphically shown in the Meeker Ditch and 7th Ave SW before and after precipitation event photos contained in my previous paper on this subject.

Rise in surface water level impacts groundwater level

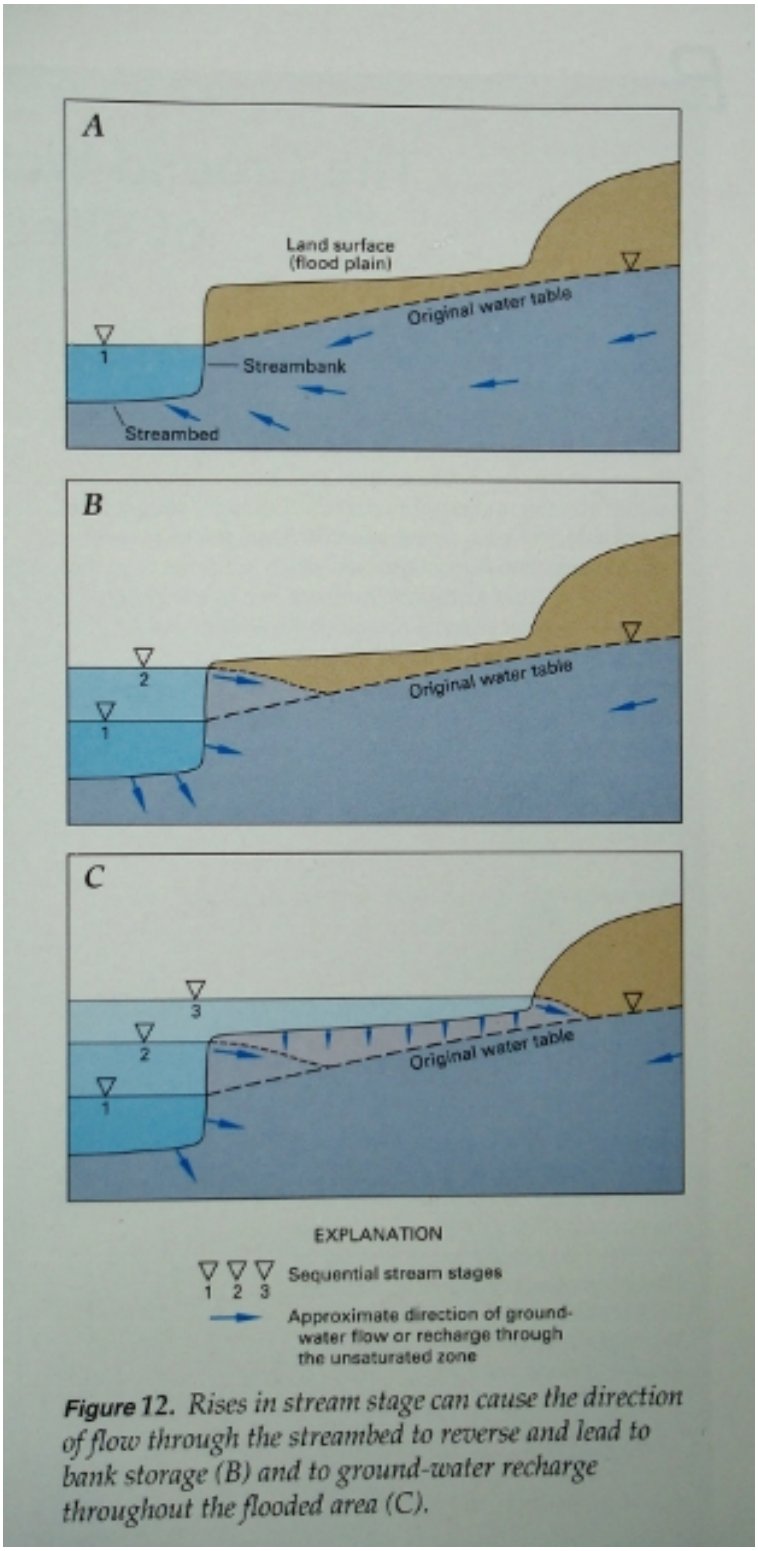

Figure 12. *Rises in stream stage can cause the direction of flow through the streambed to reverse and lead to bank storage (B) and to ground-water recharge throughout the flooded area (C).*

In the case of Clarks Creek the rise in surface and groundwater level is likely due to shoaling, i.e., sediment buildup on Clarks Creek's stream bed.

The gradual post development rise in groundwater levels caused by Clarks Creek shoaling has resulted in saturating near surface alluvial soils containing iron compounds which under anoxic (oxygen deprived) conditions become soluble and mobile as ferrous ions (Fe++). It is this ferrous ion enriched groundwater that is now flowing into these dug drainage ditches, tiles and culverts that discharge into Clarks Creek to cause its iron oxyhydroxide pollution and contribute to its shoaling.

Remedial Action Required

Hydraulic suction dredging of Clarks Creek to remove the accumulated sand, iron oxyhydroxide, silt and organic matter that has caused its shoaling, excessive aquatic plant growth and impaired macroinvertebrate and salmonid habitat and lower the area groundwater level is the appropriate remedial action required to both restore the natural functioning of Clarks Creek and intended function of the area wide surface water drainage system.

It is essential that everything be done to assure that the scheduled 400 foot demonstration hydraulic suction dredging demonstration of Clarks Creek takes place as scheduled this July since it is the most promising approach to solving the numerous problems that now deny citizens and salmon beneficial use of Clarks Creek.

Don Russell
5/28/13