Baseline Stream Flow and Temperature Data for Lozelle and Dowsville Brooks and Proposed Stormwater Improvements for Harwood Union High School

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Introduction/Background

Act 64, the Vermont Clean Water Act, was passed on June 16th, 2015. The purpose of this act was to make sure that not only Lake Champlain remains clean, but to ensure there is clean water for the entire state. The forthcoming rules require management of sediment and nutrient pollution from roads, developed land, agriculture, stream channels, and forestry activities. Harwood Union Middle/High School (HUMHS), was completed in 1965, before management of sediment and pollution was required. The school was not equipped with the necessary facilities and systems to manage this pollution and excess sediments. Figure 1 shows proposed plans by Watershed Consulting Associates, LLC, to improve stormwater management at HUMHS. The purpose of the study depicted in the overall poster was to collect baseline data on Lozelle and Dowsville Brooks using data loggers so that flow and temperature data can be compared after stormwater improvements are carried out.

Methods and Materials

All methods were described in more detail in "Independent Projects for High School Students", at http://epscor.uvm.edu/sje/scripts/get_oc_file.php?file=cwdd/RACC_HS/2015_RACC_HS/2015_RACCHighSchoolManual.pdf

Stage sensors were installed in mid September and removed in late November and measured water depth every ten minutes. Stage sensors were located in Lozelle Brook, upstream and downstream of HUMHS, and in Dowsville Brook (Figure 2). Temperature sensors were installed at the upstream Lozelle site and Dowsville Brook on August 1 and removed in late November. Approximate location of stage and temperature sensors were as follows - Upstream Lozelle Brook = UTM 4902720N, 676690E: Downstream Lozelle Brook = 4901670N, 677150E: and Dowsville Brook = 4901570N, 677260E. All data shown in graphs were collected from Lozelle and Dowsville Brook in 2015.

Figure 2. Lozelle and Dowsville Brooks Watersheds and Mad River Stage Monitor.

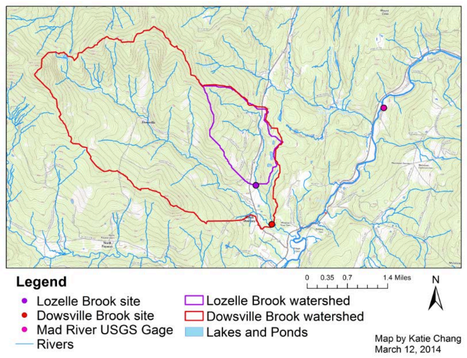

Figure 1 Proposed Stormwater Improvement at Harwood Union Middle/High School by Watershed Consulting Associates LLC

Proposed Stormwater Management Improvements

A consultant, Watershed Consulting Associates, LLC, proposed the following improvements for stormwater and sediment management at HUMHS:

- Rain gardens between parking lot & field, school & fire pond, parking lot & Lozelle, by the bus barn, on school's roof and in front of school where drains are present
- Tree islands to help filter and collect water
- Plant trees along outer edge of front field
- Underground system of pipes with filtration under parking lot(s) to allow water into ground
- Rainwater collection system around school
- Have a filtration system for runoff before it enters the stream(s)

Our suggestions

- Reconstruct culverts leading into the Lozelle Brook (e.g. behind bus barn)
- Allow grass to grow more by cutting less; leave grass clippings (lower costs for school to water and maintain grass)
- Outfall filtration system for runoff, trash, and wood chips before it enters Lozelle Brook for all sides of bus barn and storm drains
- More trees by concrete staircase by Kate's garden, between Kate's garden and parking lot, opposite side of drainage ditch by bus barn, on hill between upper and lower side fields, and inner field of track to help soak up excess water and prevent erosion
- Buffer between RT 100 and school's front field, and before and after culvert under the access point to track
- Rain water collection around bus barn
- Restore forests and habitats around fields after the construction of new field

Discussion /Conclusions

- Figure 3 – The upstream Lozelle Brook (ULB), Downstream Lozelle Brook (DLB) and Dowsville Brook (DB) sensor data all matched well with similar peaks. ULB and DB were extremely closely matched whereas DLB seems to show extra flows, potentially from excess runoff, due to impermeable surfaces just downstream from ULB. This data will serve as future baseline data to compare flows after stormwater improvements on the impervious surfaces at the Harwood campus.
- Figure 4- ULB and DB had similar temperature profiles. From mid-August to early September, ULB was 0-3.0ºC warmer than DB and its daily temperature cycle of variation was about 1.5 to 4.5ºC compared to about 0.5 to 3.5 ºC daily variation for DB. By mid-October the stream temperatures were similar and daily variation was about 2-3 ºC or less. In the study period, the maximum temperature for ULB was 22ºC and maximum temperature for DB was 20.5ºC.
- Figures 5 and 6 – Peak streams flows are often accompanied by a peak in stream temperature. Nonstorm-event water level appeared to be slightly increasing from mid-September to mid- November, likely due to the loss of leaves on the trees, reduced photosynthesis and reduced transpiration

Acknowledgments

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Figure 3. Stage Sensor Depth Versus Time

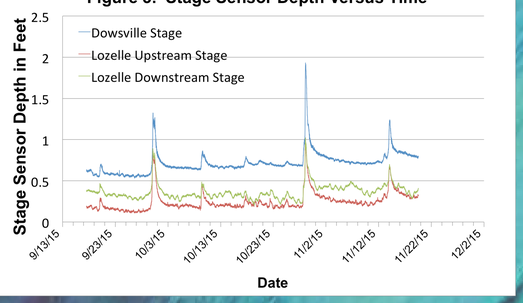

Figure 4. Temperature Versus Date for Lozelle and Dowsville Brooks 2015

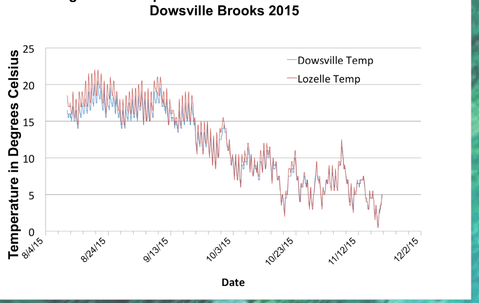

Figure 5. Dowsville Brook Temperature and Stage Elevation Versus Date - 2015

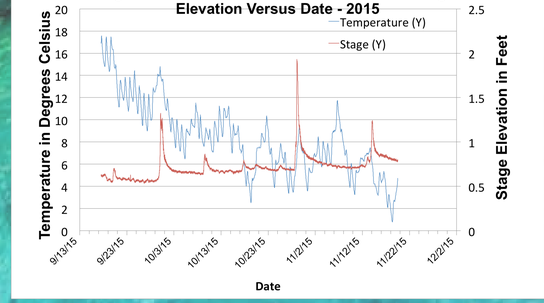

Figure 6. Lozelle Brook Temperature and Stage Elevation Versus Date - 2015