Soldotna Creek Flow Project

***Conducted by the Kenai Watershed Forum***

**Purpose**

The purpose of this study was to use salt tracer techniques to determine flow rates along Soldotna Creek.

**Dates of Fieldwork**

September 6, 2011

September 15, 2011

**Methods**

1. Calibrated Hydrolabs in the laboratory using a HYDROLAB Conductivity Standard Solution of potassium chloride at varying concentrations, programmed the instruments with run times
2. Deployed HydroLabs along Soldotna Creek
3. Dissolved 25 lbs salt in ~ 55 gallons of creek water and dumped into the creek as a single slug of salt solution
4. Retrieved Hydrolabs after slug moved through
5. Downloaded conductivity data and removed any outlying data points
6. Recorded time of slug passage at the beginning of the spike, middle and end of spike
7. Calculated travel time from slug injection to each Hydrolab location
8. Calculated travel distances from the injection point to each Hydrolab with measurements derived from imagery in Google earth® and LiDAR
9. Divided the length of creek traveled by the time it took the salt slug to reach that point to get flow rates (Flow =distance/time) for each of the reaches

Due to a beaver dam located approximately half way down the creek and the dispersion that would occur from the upper injection point to the mouth of Soldotna Creek, the creek was divided into two sections. One was above the dam and the other was immediately below it.

**Results**

*September 6, 2011*

Salt slug was dumped on 09/06/11 at 13:31. The flow gauge read 1.15. The following summarizes the time it took for the slug to first show up in the data, for the peak concentration to pass and the travel times for the slug to get to each Hydrolab.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Hydrolab Name** | **Time at Start of Peak (hh:mm)** | **Time at Top of Peak (hh:mm)** | **Time at End of Peak (hh:mm)** | **Travel Time from Injection Point to the Top of the Peak (hh:mm)** | **Width of Peak (hh:mm)** |
| Hydrolab 1-090611 | 9/6/11 14:52 | 9/6/11 15:17 | 9/6/11 16:42 | 1:47 | 1:50 |
| Hydrolab 2 -090611 | 9/6/11 17:12 | 9/6/11 3:00 | 9/6/11 19:49 | 13:30 | 2:37 |
| Hydrolab 3-090611 | 9/6/11 22:25 | 9/7/11 0:03 | 9/7/11 3:40 | 10:33 | 5:15 |
| Hydrolab 4-090611 | 9/7/11 3:02 | 9/7/11 4:46 | 9/7/11 8:55 | 15:16 | 5:53 |
| Hydrolab 5-090611 | 9/7/11 3:35 | 9/7/11 5:35 | 9/7/11 9:51 | 16:05 | 6:16 |

The following is a summary of flow rates in each reach where length is the distance between points. Travel times are the amount of time it took the peak of the slug to pass through each point.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reach Name** | **Travel Time (seconds)** | **Length (ft)** | **Flow=Length/Time (ft/s)** |
| Injection Point 1 to Hydrolab 1-090611 | 6420 | 1586 | 0.25 |
| Hydrolab 1-090611 to Hydrolab 2-090611 | 9960 | 1935 | 0.19 |
| Hydrolab 2-090611 to Hydrolab 3-090611 | 21600 | 7714 | 0.36 |
| Hydrolab 3-090611 to Hydrolab 4-090611 | 16980 | 7639 | 0.45 |
| Hydrolab 4-090611 to Hydrolab 5-090611 | 2940 | 892 | 0.30 |

*September 15, 2011*

Salt slug was dumped on 09/15/11 at 15:30. The flow gauge read 0.90. The following summarizes the time it took for the slug to first show up in the data, for the peak concentration to pass and the travel times for the slug to get to each Hydrolab.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Hydrolab Name** | **Time at Start of Peak (hh:mm)** | **Time at Top of Peak (hh:mm)** | **Time at End of Peak (hh:mm)** | **Travel Time from Injection Point to the Top of the Peak (hh:mm)** | **Width of Peak (hh:mm)** |
| Hydrolab 1-0901511 | **-------------FAILED TO TAKE DATA--------------** | | | | |
| Hydrolab 2 -091511 | 9/15/11 23:07 | 9/16/11 0:36 | 9/16/11 3:06 | 9:06 | 3:59 |
| Hydrolab 3-091511 | 9/16/11 5:32 | 9/16/11 7:19 | 9/16/11 11:02 | 15:49 | 5:30 |
| Hydrolab 4-091511 | 9/16/11 10:22 | 9/16/11 12:20 | N/A | 20:50 | N/A |
| Hydrolab 5-091511 | 9/16/11 11:51 | 9/16/11 | N/A | 21:44 | N/A |
| Hydrolab 6-  091511 | **-------------FAILED TO TAKE DATA--------------** | | | | |

Note, for Hydrolabs 4 and 5 the peaks were partial because the instruments were pulled before the slug had finished moving through. On both graphs the top of the peak is visible but the right slope is incomplete.

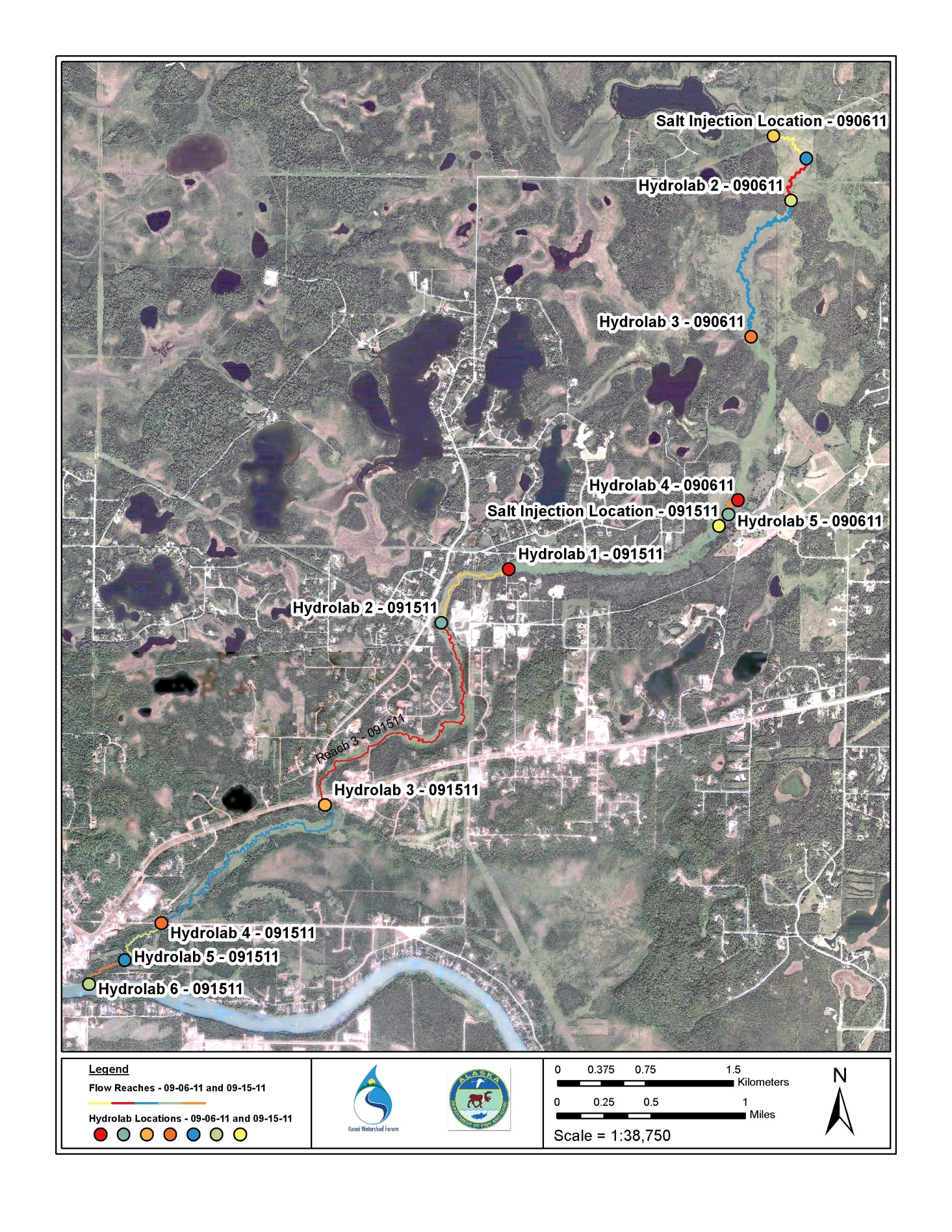
The following is a summary of flow rates in each reach where length is the distance between points. Travel times are the amount of time it took the peak of the slug to pass through each point.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reach Name** | **Travel Time (seconds)** | **Length (ft)** | **Flow=Length/Time (ft/s)** |
| Reach 1 –  091511 | N/A | 10,630 | N/A |
| Reach 2 –  091511 | 32760 | 14,550 (10,630 (Reach 1) + 3,920 (Reach 2)) | 0.44 |
| Reach 3 –  091511 | 24180 | 10,407 | 0.43 |
| Reach 4 –  091511 | 18060 | 10,071 | 0.56 |
| Reach 5 –  091511 | 3240 | 1,988 | 0.61 |
| Reach 6 –  091511 | N/A | 1,473 | N/A |

**Discussion**

For the upper reach flow rates ranged from 0.19 to 0.45 ft/s. For the lower reach flow rates ranged from 0.43 to 0.61 ft/s. Based on elevation changes, the lower reach has substantially greater loss in elevation which, consequently, should result in the higher flow rates. A decrease in cross-sectional area of the creek channel would also contribute to an increase in the flow rate.

Overall, these data serve as a good estimate of flow. They do not reflect channel length in oxbows and slough channels. When the upper portion of the creek was floated several of these side features were noted. Furthermore, lengths were based on imagery in Google earth® and LiDAR and do not represent exact measurements. These values should serve as a guide to understanding how flow behaves in Soldotna Creek and not to be used as exact figures.

****