

## Exercise 4: Stream Channel Gradient and Water Quality



**Prepared by:**

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The class pays close attention as Professor Bennett explains the exercise.

## **Objectives:**

The purpose of this exercise was to introduce students to the collection of stream channel gradient data and water quality data.

The goals of this exercise were:

1. to learn how to collect and process stream channel gradients and basic water quality indices;
2. to assess downstream changes in these parameters and their possible controls.



## *Elevation and Depth Measurements*



Jason sets up the theodolite and gets ready to take upstream and downstream elevation measurements.



Steve holds the stadia rod for Jason and reads the upstream and downstream depths of the stream.



## *Water Quality Measurements*

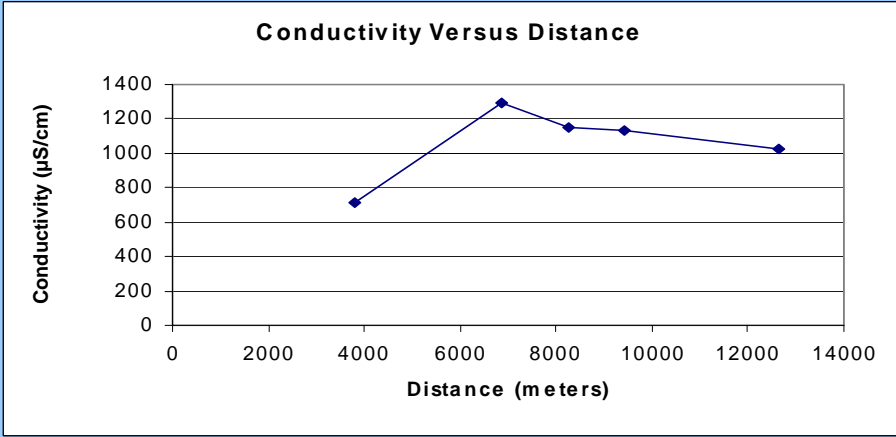


Andrew uses the conductivity meter to record other water quality parameters (conductivity, salinity, total dissolved solids, and temperature).



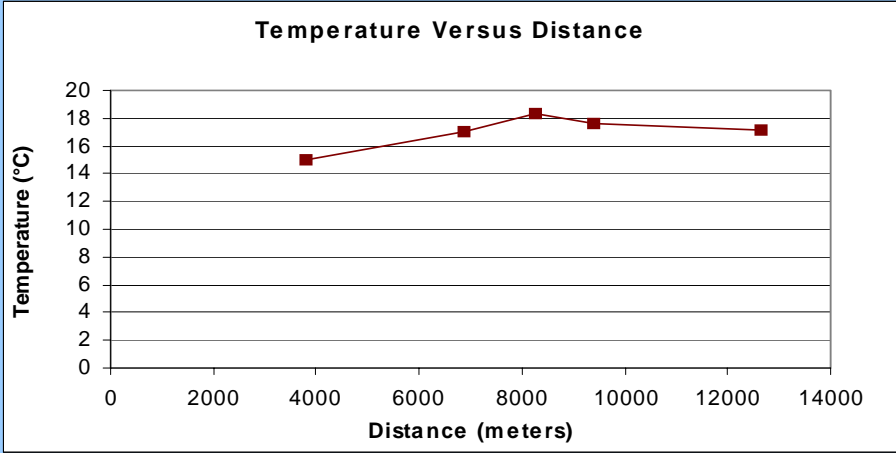
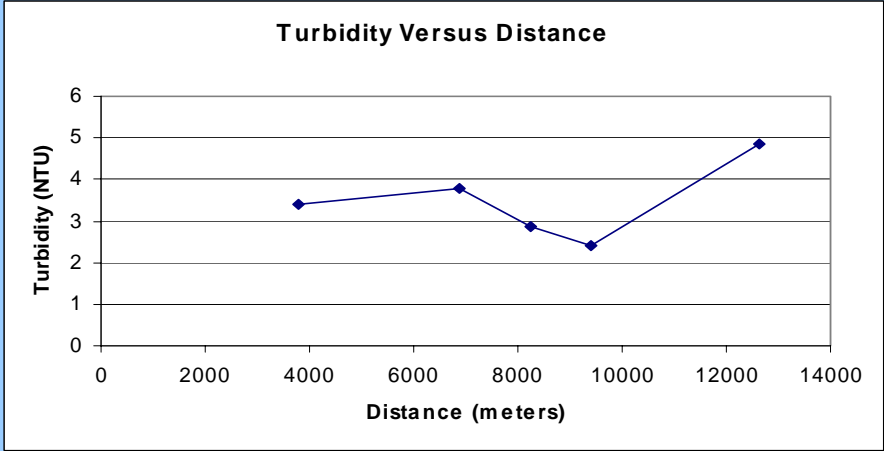
Heather and Andrew are busy reading the turbidimeter.

# Water Quality Data Results



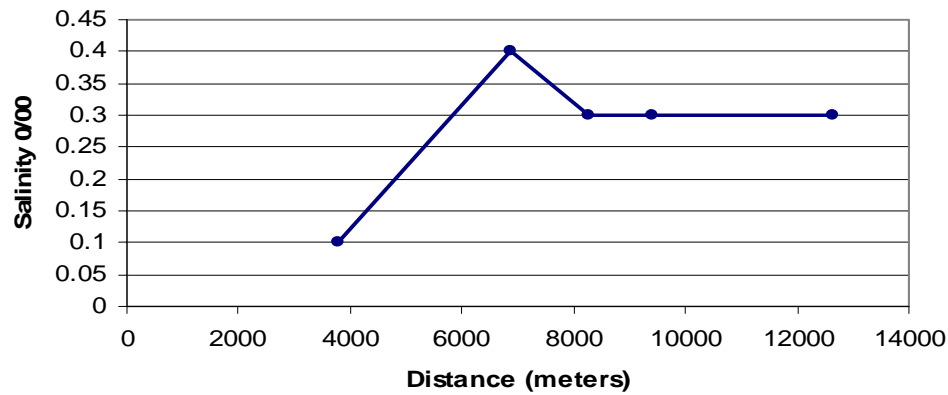
Conductivity increased with distance downstream.

Turbidity increased with distance downstream.



Temperature increased with distance downstream.

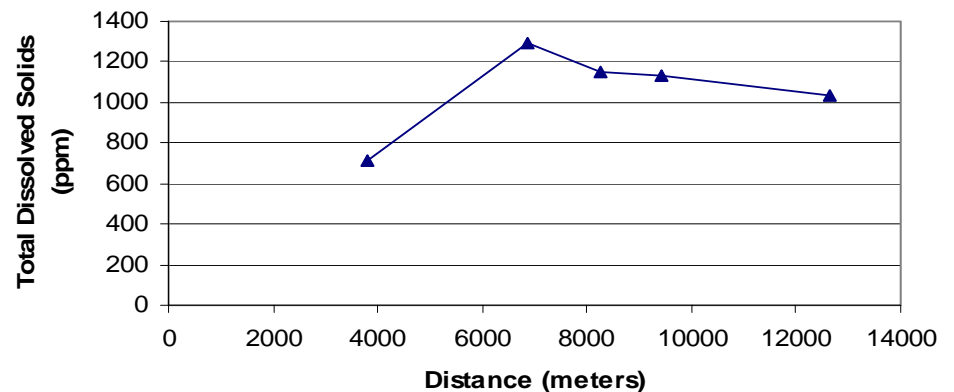
**Salinity Versus Distance**



Salinity increases with distance downstream.

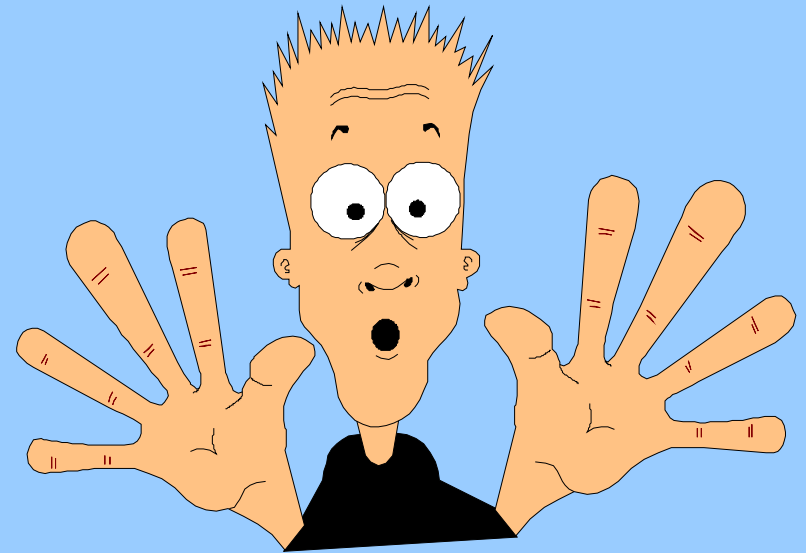
TDS increased with distance downstream.

**Total Dissolved Solids Versus Distance**



Relative to the other stations, Station 1 showed lower levels of total dissolved solids, indicating a higher degree of water quality.

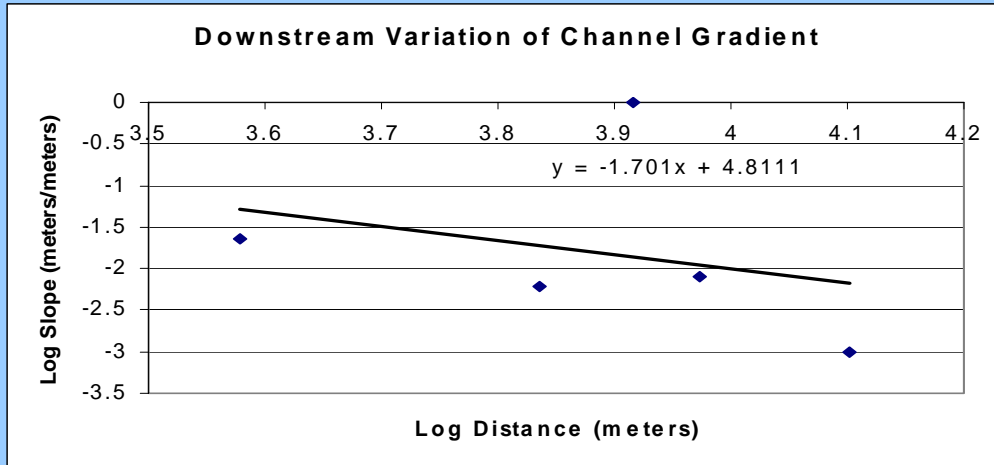




Stories and exaggerations  
also increased downstream.

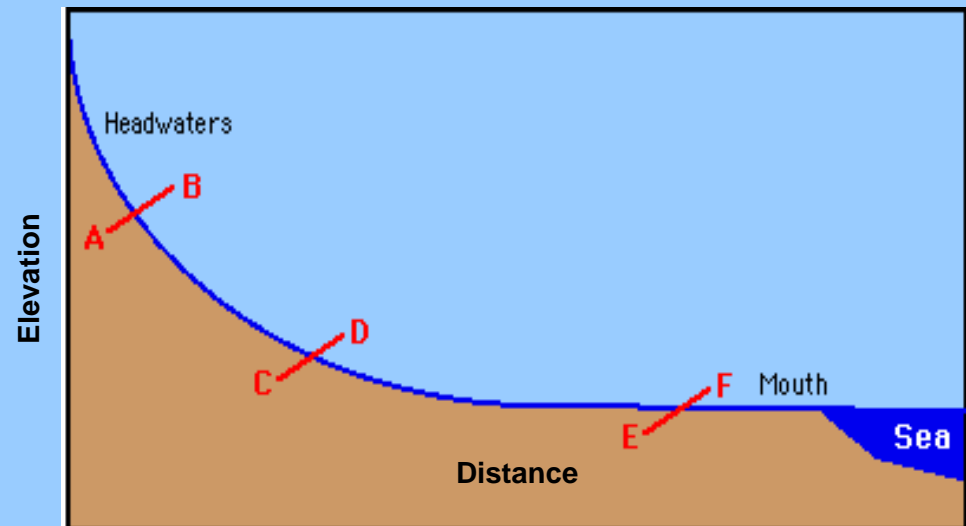
Dr. Bennett describes  
“the one that got away.”

## Conclusions of the exercise:



Slope (gradient) decreases with distance downstream. The slope of the line is negative, representing a longitudinal profile that is concave upwards, and negatively correlated with stream discharge (where slope decreases, discharge increases downstream).

At its headwaters, the grade of a stream is usually steep. As streams get closer to their base level, the angle of the grade becomes more gently-sloping. Near the mouth of the stream, the grade becomes almost flat. The main control on overall stream gradient is the relief/height of the basin.



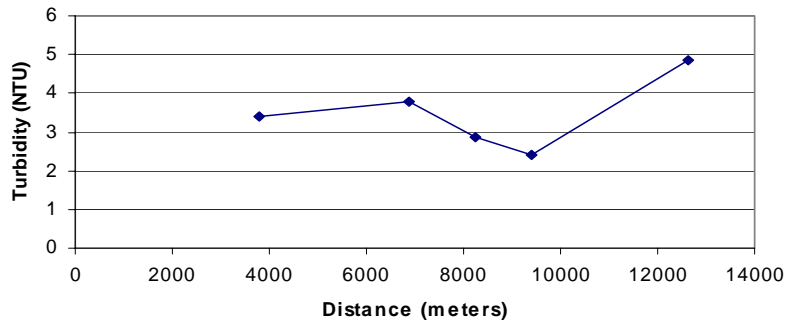
Topographic longitudinal profile of a stream

Source: <http://www.physicalgeography.net/fundamentals/10y.html>

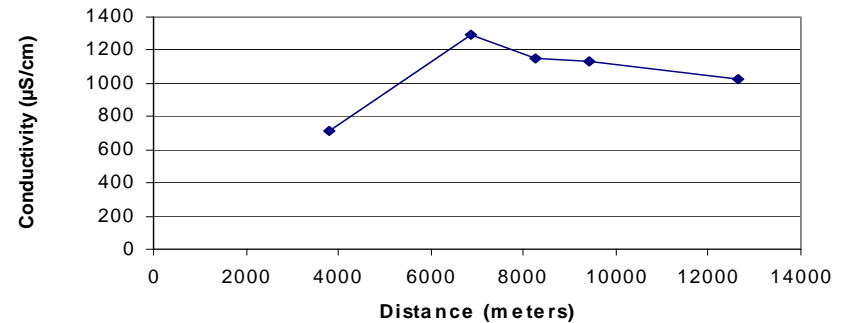


# Potential Sources of Error:

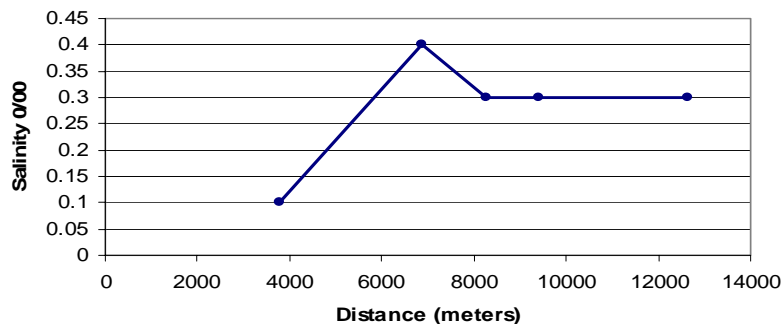
**Turbidity Versus Distance**



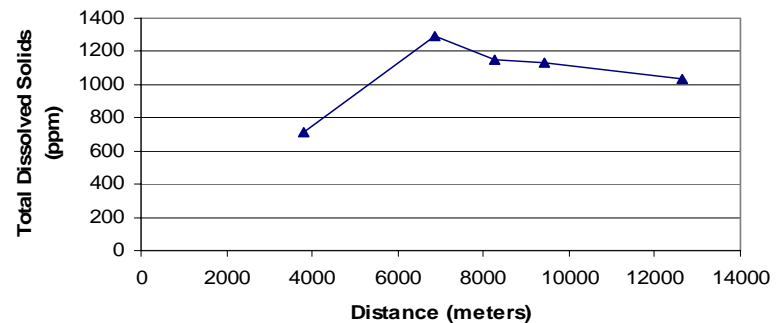
**Conductivity Versus Distance**



**Salinity Versus Distance**



**Total Dissolved Solids Versus Distance**



As the curves all show, the levels of turbidity, conductivity, salinity, and total dissolved solids all fluctuate from station to station. One possible explanation for this is the disturbance of the stream bed upstream of a station by other students which would increase the amount of suspended material and affect water samples at a station downstream.



References:

Physical Geography.net: Streamflow and Fluvial Processes.

Online: <http://www.physicalgeography.net/fundamentals/10y.html> (Oct 2005).