

Instructions for Developing and Using a Conductivity-Chloride Rating Curve

Method Overview:

1. Measure and record conductivity and chloride during: 1) baseflow, 2) salt spikes, 3) dilution events.
2. Plot range of conductivity and chloride values as a scatterplot in Excel (or other graphing program).
3. Fit a curve to the scatterplot and display the curve equation.
4. Use curve equation to convert continuous conductivity data to chloride OR to simply add context to future conductivity measurements.

What you'll need:

| Specific to this work | General |
|---|--|
| <ul style="list-style-type: none">• Chloride QuanTab® Test Strips: Low range 30-600 mg/L and High range 300-6000 mg/L• Data Sheet: Conductivity-Chloride Rating Curve Sampling Sheet• Smartphone (to access Monitor My Watershed) OR calibrated handheld Conductivity meter• Sensor brush (if using EnviroDIY station for conductivity data) | <ul style="list-style-type: none">• Waders or knee boots• Clipboard• Pencils• Other supplementary items<ul style="list-style-type: none">○ Camera○ First Aid kit |

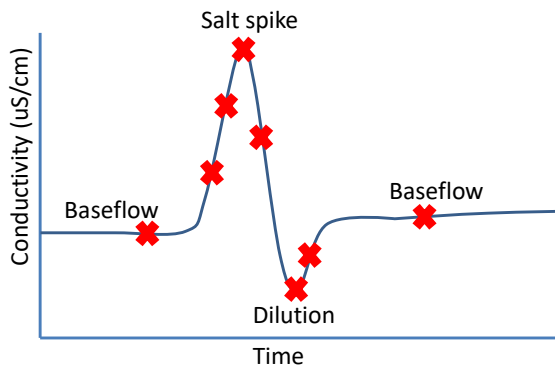
Where to sample:

- At an EnviroDIY continuous monitoring station.
- At a USGS continuous monitoring station.
- Anywhere you want (exclude step 4)

When to collect samples:

- At baseflow when conductivity is at its usual level.
- When conductivity is elevated (spiking) during/after winter storm(s) – use historic data to determine range of values.
- During storm(s) when conductivity levels are reduced (i.e., stream water is diluted).

Example times to collect data:



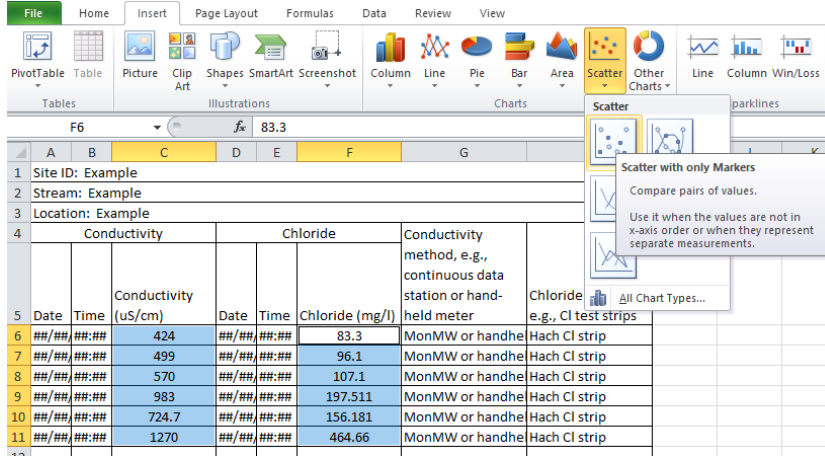
Detailed steps:

1. **Measure and record chloride and conductivity during: 1) baseflow, 2) salt spikes, 3) dilution events**
 - a. Measure Chloride using Hach test strip according to manufacturer directions and record date, time, and result on data sheet.
 - i. Use an approximate Cond:Cl ratio of 4:1 to determine whether low range or high range test strip should be used.
 - b. Immediately after beginning the chloride test strip measurement, measure conductivity via a continuous sensor (e.g., EnviroDIY station on Monitor My Watershed) or a calibrated hand-held meter (e.g., Hanna EC Tester DiST3) and record date, time, and result on data sheet.

- i. Note: If you are using conductivity data from an EnviroDIY continuous station make sure the sensor is clean before using the data.

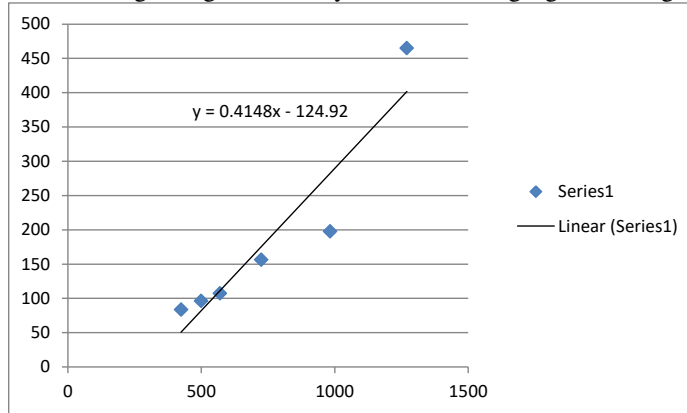
2. Plot range of conductivity and chloride values as a scatterplot in Excel (or other graphing program)

- a. Enter values from Conductivity-Chloride Rating Curve Sampling Sheet into an electronic copy of this data sheet (or a generic Excel worksheet).
- b. To plot the data, select the conductivity and chloride data ranges in your worksheet, click the Insert tab, then click the “Scatter” icon and choose “Scatter with only Markers” option (left column conductivity should be on the x-axis and right column chloride on the y-axis).



3. Fit a curve to the scatterplot and display the curve equation

- a. Right click on the points in the graph and select “Add trendline” from the dropdown.
- b. Under Trendline Options, select Linear and at the bottom click on “Display Equation on chart” then click Close.
 - i. Note: Depending on the distribution of data points, Polynomial or Power options may produce a better fit. Or use “broken-stick” regression to represent different ranges, particularly low range values during stream dilution events.
- c. The rating curve equation should now be displayed along with the rating curve; format graph as needed using Design tab and by double-clicking/right-clicking axes and titles.



4. Use curve equation to convert continuous conductivity data to chloride

- a. Using Excel equation function (fx), apply rating curve equation to continuous conductivity data.

| E2 | | fx = 0.4148*D2 - 124.92 | | | |
|----|-----------------|-------------------------|------------------|---------------------|-----------------|
| | A | B | C | D | E |
| 1 | DateTime | TimeOffset | DateTimeUTC | Decagon_CTD-10_Cond | Chloride (mg/l) |
| 2 | 10/13/2021 8:00 | -5:00 | 10/13/2021 13:00 | 1128.7 | 343.3 |
| 3 | 10/13/2021 8:05 | -5:00 | 10/13/2021 13:05 | 1129.5 | 343.6 |
| 4 | 10/13/2021 8:10 | -5:00 | 10/13/2021 13:10 | 1106.2 | 333.9 |
| 5 | 10/13/2021 8:15 | -5:00 | 10/13/2021 13:15 | 1114.5 | 337.4 |