Flint River GREEN: Temperature

FLINT RIVER WATERSHED COALITION

MATERIALS

- Calibrated Thermometer (°C)
- Stopwatch or Timer
- Waders or Rubber Boots
- Calculator

VOCABULARY

- Stream Reach
- Coldwater Stream
- Warmwater Stream
- Metabolic Rates
- Industrial Pollution
- Impervious Surfaces
- Thermal Pollution

WATER QUALITY STANDARDS

DRINKING WATER:

- No drinking water standards

SURFACE WATER:

- ≤ 5°F temperature difference in **stream reach**

WHAT DOES THIS TEST MEASURE?

Water temperature determines what kind of fish or other organisms will live in a habitat. Water temperature influences many systems such as the amount of oxygen that can be dissolved in the water, the rate of photosynthesis by aquatic plants, the **metabolic rates** of aquatic organisms, and the sensitivity of organisms to toxic wastes, parasites and diseases. Some animals can only live in cool water, like trout. This test will also measure the change in water temperature between two points to help identify any **stream reaches** that undergo large temperature changes that could be caused by **thermal pollution**.

LOOK FOR THESE CAUSES

EVIDENCE FOR DECREASES IN TEMPERATURE?

- Is there a lot of shade covering your stream at your sample location? How much shade occurs upstream?

EVIDENCE FOR INCREASES IN TEMPERATURE?

- Is there **Industrial pollution** upstream?
- Is there runoff from **impervious surfaces ?**
- Do you see evidence of soil erosion nearby (more sediment in the water will cause it to heat up)?

CONNECTING CONCEPTS

- **Coldwater Streams** (°F) have an average monthly temperature at or below the following: J:38 F:38 M:43 A:54 M:65 J:68 J:68 A:68 S:63 0:56 N:48 D:40. **Warmwater Streams** (°F) have an average monthly temperature at or above the following: J:41 F:40 M:50 A:63 M:76 J:84 J:85 A:85 S:79 0:68 N:55 D:43
- Dark surfaces and particles heat up because dark colors absorb the sun's rays.
- Water temperature fluctuates between day and night and over seasons and years.
- Colder water can hold more dissolved oxygen.

WEB LINKS

- USGS Water Science School: https://water.usgs.gov/edu/temperature.html
- List of Michigan's Coldwater Streams: http://www.michigandnr.com/law/law_book/orders/Fisheries%20Orders.html#FO210
- Case Study: Thermal Pollution in Rivers—Will Adding Gravel Help Cool Them Down? https://www.fs.fed.us/pnw/sciencef/scifi133.pdf

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PROCEDURE

1. Record a weather report:

   Date: _____ Time: _____ am/pm

   Location: _____

   Weather: _____

   Type of precipitation in the last 24 hours: rain snow sleet hail none

   Amount of precipitation in the last 24 hours: _____

   https://w2.weather.gov/climate/

   Additional notes about site: _____
2. Circle what shading conditions best describes your location for this test:
   direct sunlight *shaded* *partial shade*
3. Enter the stream wearing gloves and waders or boots. Aim to stand as close to the middle of the main stream flow as possible. SAFETY NOTE: Do not stand in water above your ankles if wearing boots or above your knees if you are wearing waders. DO NOT enter flooded streams.
4. Lower the thermometer 4" below the surface of the water. Wait 2 minutes.
5. Record your measurement in ^{o}C below.
6. Repeat this measurement 3 times: 1. _____ ^{o}C 2. _____ ^{o}C 3. _____ ^{o}C
7. Calculate an average: (Test 1 + Test 2 + Test 3)÷3= **_____ ^{o}C at sample site.**
8. Report this value to the Dissolved Oxygen testing team.
9. Repeat this test approximately 1 mile upstream in similar shading conditions as soon as possible. (Your teacher or mentor may also do this for you if that area is not accessible to students):
   _____ ^{o}C upstream.
10. Subtract the upstream from downstream temperature:
    _____ (downstream) - ____ (upstream) =_____**^{o}C Temperature Change (ΔT:^{o}C)**
11. Use the **ΔT:^{o}C** to calculate a Q-Value on the Temperature Change Chart. **Q-Value:** _____
12. Check your Q-Value by entering your temperature data at http://www.flintrivergreen.org/add-info/add-data/

WHAT TO WATCH OUT FOR

- Take your reading in the main flow of the stream. Keep the thermometer below the surface, but not touching the bottom of the stream.
- Hold your thermometer in the stream for no less than 2 minute, then read your thermometer immediately after pulling it from the water.
- Take the temperature at both locations under similar amounts of shade.
- Take the upstream temperature as soon as you can after the test site temperature. As the day heats up, so does the stream.
- Use the change in temperature between the two locations to determine the Q-Value.
- Make sure you are using Celsius: $^{o}C = (^{o}F - 32.0) \div 2.80$ $^{o}F = (^{o}C \times 1.80) + 32.0$

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Change in Temperature

Q-Value Chart