

# How Low Can They Go? *Investigating water levels of the Great Lakes.*

Amy L. [Gustafson amygus@jamadots.com](mailto:amygus@jamadots.com)

**Target Grade/Subject:** 7<sup>th</sup> grade / Science and Math

## **Lesson Overview:**

This lesson engages students in activities that will enhance their understanding of how and why Great Lakes water levels change, and the impacts of those level fluctuations. Students will use real-world data to create and analyze statistical data displays, and investigate how changing water level fluctuations will affect travel in the Great Lakes.

## **Sources Consulted:**

NOAA – water levels of the Great Lakes (updated 2011)

<http://www.glerl.noaa.gov/pubs/brochures/lakelevels/lakelevels.pdf>

US Army Corps of Engineers - Monthly Bulletin Of Lake Levels For The Great Lakes

[http://www.lre.usace.army.mil/\\_kd/Items/actions.cfm?action=Show&item\\_id=3887&destination=ShowItem](http://www.lre.usace.army.mil/_kd/Items/actions.cfm?action=Show&item_id=3887&destination=ShowItem)

US Army Corps of Engineers – actual data per chosen lake and chosen year

<http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata/greatlakeshydrographs/>

## **Learning Objectives:**

*After this lesson, students will be able to*

- a. Draw/sketch and label the parts of the hydrologic cycle
- b. Make conclusions on the effects of levels fluctuating in the great lakes.
- c. Explain what IGLD stands for and how it is used to measure levels
- d. Create at least one type of data display using frequency tables, scatter plots, box–and–whiskers plots etc.
- e. Analyze data to recognize measures of central tendencies
- f. Describe data, using range, outliers etc.

## **State of Michigan benchmarks:**

**S.IA.07.11** Analyze information from data tables and graphs to answer scientific questions.

**S.RS.07.15** Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.

**E.ES.07.11** Demonstrate, using a model or drawing, the relationship between the warming by the sun of the Earth and the water cycle as it applies to the

atmosphere (evaporation, water vapor, warm air rising, cooling, condensation, clouds).

**E.ES.07.81** Explain the water cycle and describe how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff, ground water, and absorption occur within the cycle.

**D.RE.07.01** Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions.

**D.AN.07.02** Create and interpret scatter plots and find line of best fit; use an estimated line of best fit to answer questions about the data.

**D.AN.07.04** Find and interpret the median, quartiles, and interquartile range of a given set of data.

**List of Materials:**

Typing paper – 3 sheets per students

Colored pencils

Data of water levels for a certain great lake

Calculator – optional

Computer with internet - optional

Smart board – optional

**New Vocabulary:**

Mean – the average of the numbers: a calculated "central" value of a set of numbers.

It is easy to calculate: Just add up all the numbers, then divide by how many numbers there are.

Median – The middle number (in a sorted list of numbers). Half the numbers in the list are less, and half the numbers are greater. To find the Median, place the numbers you are given in value order and find the middle number.

Mode – is the value that occurs most often. If no number is repeated, then there is no mode for the list.

Range – is just the difference between the largest and smallest values.

IGLD – International Great Lakes Datum IGLD (1985) has its zero base at Rimouski, Quebec near the mouth of the St. Lawrence River (approximate sea level).

Condensation – is the process by which matter transitions from a gas (or vapor) phase into a liquid phase

Precipitation – any form of water, such as rain, snow, sleet, or hail, that falls to the earth's surface

Evaporation – to convert or change into a vapor.

Transpiration – is the process of the absorption of water by plants, usually through the roots, the movement of water through plants, and the loss of the water to the atmosphere through small openings on the underside of leaves called stomata

Runoff – is a term used to describe the water from rain, snowmelt or irrigation that flows over the land surface and is not absorbed into the ground, instead flowing into streams or other surface waters or land depressions

**Focus Question:**

In their science journals, ask students to answer the following questions(to be discussed later):

1. When you have a glass of water, where does it come from?
2. How does that water get there?
3. What did you have for breakfast? (or dinner last night?)
4. Where did that item come from?
5. How did that item get there?

**Procedure/Classroom Activities:**

1. In lecture format I will cover the hydrologic cycle with the class as a whole, using the website: <http://www.glerl.noaa.gov/pubs/brochures/lakelevels/lakelevels.pdf>. This can be done either using a smart board, a computer or lecture with notes on overhead or dry erase board. This is where we will incorporate the focus questions #1 – 2 as to illustrate the importance of the hydrologic cycle.
2. Students will then draw/sketch and color the hydrologic cycle on a piece of typing paper. They will also include the definitions of the following terms: condensation, evaporation, transpiration, runoff, and precipitation.
3. As class discussion we will then come up with ways that the group thinks fluctuating levels in the great lakes can affect transportation of ships (including commercial, recreational, fishing, bulk transport etc.). We will refer back to website in #1 if more ideas needed for this part. Students will come up how this might affect their personal lives. This is where we will incorporate the focus questions #3 – 5 as to illustrate the importance of shipping etc. on the great lakes.
4. Using this website, we would choose some data gathering stations (close to home) and discuss the IGLB scale etc. and the students will discuss various graphs and help to interpret their meanings. This information is current.  
[http://tidesandcurrents.noaa.gov/station\\_retrieve.shtml?type=Great+Lakes+Water+Level+Data](http://tidesandcurrents.noaa.gov/station_retrieve.shtml?type=Great+Lakes+Water+Level+Data)
5. Using this website, either students could look up a particular lake and choose a year, or the teacher could have done and printed off ahead of time. Given the data the student will make a data display using one of the following types: stem-and-leaf plot, frequency table, box-and-whisker plot, line/bar graph, or histogram of one year's (month by month) lake levels.  
<http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata/greatlakeshydrographs/>
6. Using the data they chose in #5 the student will now calculate the following: mean, median, mode, range, Outliers etc.

7. Comparisons could be handled in the following ways:
  - a. Each student does same lake, different year (to establish trends)
  - b. Each student does different lake, same year (to establish comparisons between lakes)
  - c. Each student could choose a lake and do a 5 year span to compare from year to year.
8. Students will then write a summary paragraph that includes 3 things they learned from these lessons. One of which must be related to one of the 5 focus questions that they wrote in the beginning.

**Assessment:**

Much of the assessment will be verbal, during discussion, to demonstrate understanding. The hydrologic cycle created by students will be turned and then shared for display. The data display they created will be shared and explained within a small group, then checked over by teacher for accuracy.

Student's calculations will be turned in and graded for accuracy.

Final assessment will be for students to share one thing they learned with the class and then turn in their paragraphs to be graded for completion only.

**Extensions:**

1. Students could further compare difference between the great lakes and how travels occurs between them despite the differences in levels.
2. Students could design and build locks in which toy boats will travel
3. Students could come up with other comparisons about great lakes, besides water levels. Could include: amount of ship travel on each lake, amount of commercial fishing on each lake, populations of different species between lakes etc.