Nemadji River Data

Overview: This lesson allows students to graph data from the Nemadji River for river flow as well as corresponding rainfall for both baseline conditions from 2015 and flood conditions from 2012. Includes worksheet to guide students through the analysis on the Rivers2Lake website.

Subject Areas: Math, Science
Grade Levels: 6-8
Topics: Earth Science/Geology, STEM (Science, Technology, Engineering, Math)

Great Lakes Literacy Principles:
1. The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean.
4. Water makes Earth habitable; fresh water sustains life on land. :
5. The Great Lakes support a broad diversity of life and ecosystems.

Material:

- Data and figures below
- Student worksheet (on Rivers2Lake website)

Optional videos to show students: https://m.youtube.com/watch?v=dQy5CqsStGM
https://m.youtube.com/watch?v=dWUQngfHx9c

Standards:
Next Generation Science Standards:

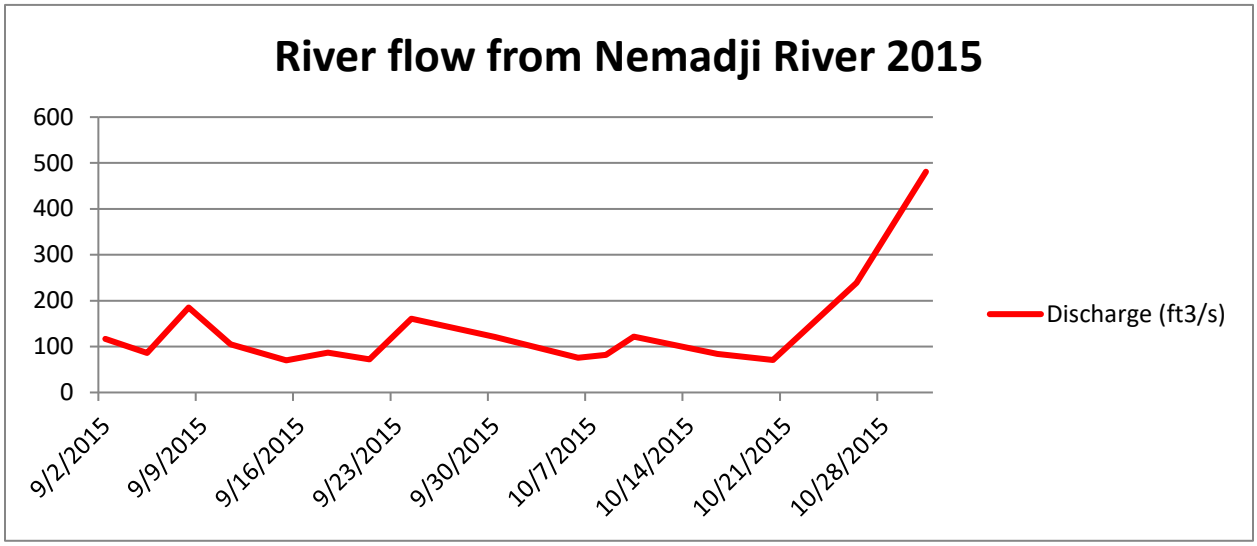
MS-ESS2-4. *Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]*

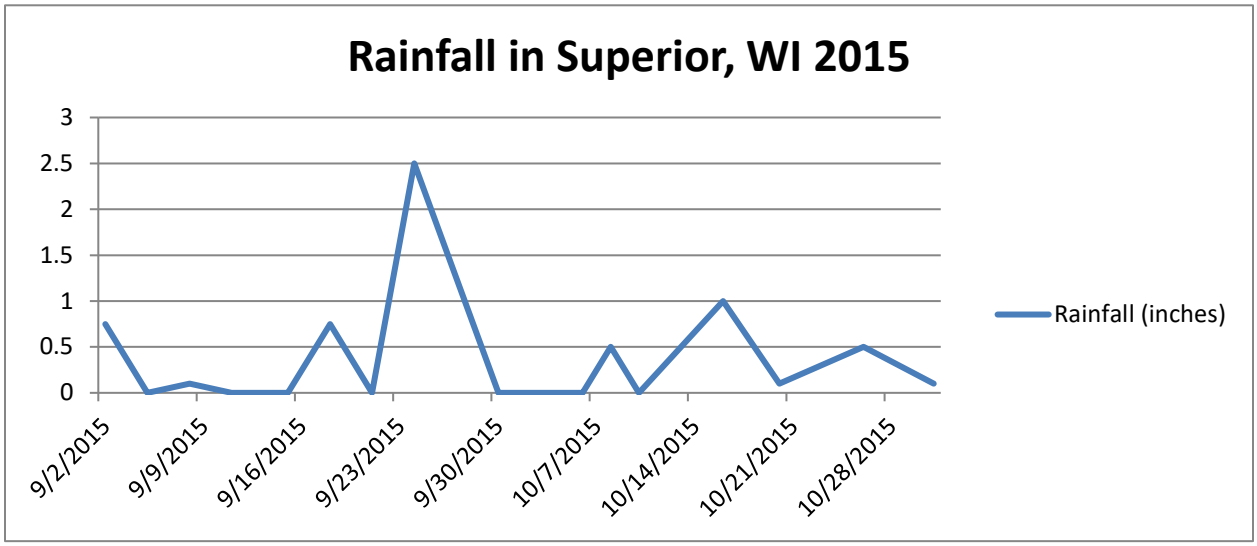
Common Core: Grade 8
Science: A.8.3 Defend explanations and models by collecting and organizing evidence that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them
Math: Statistics and Probability 8.SP: Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

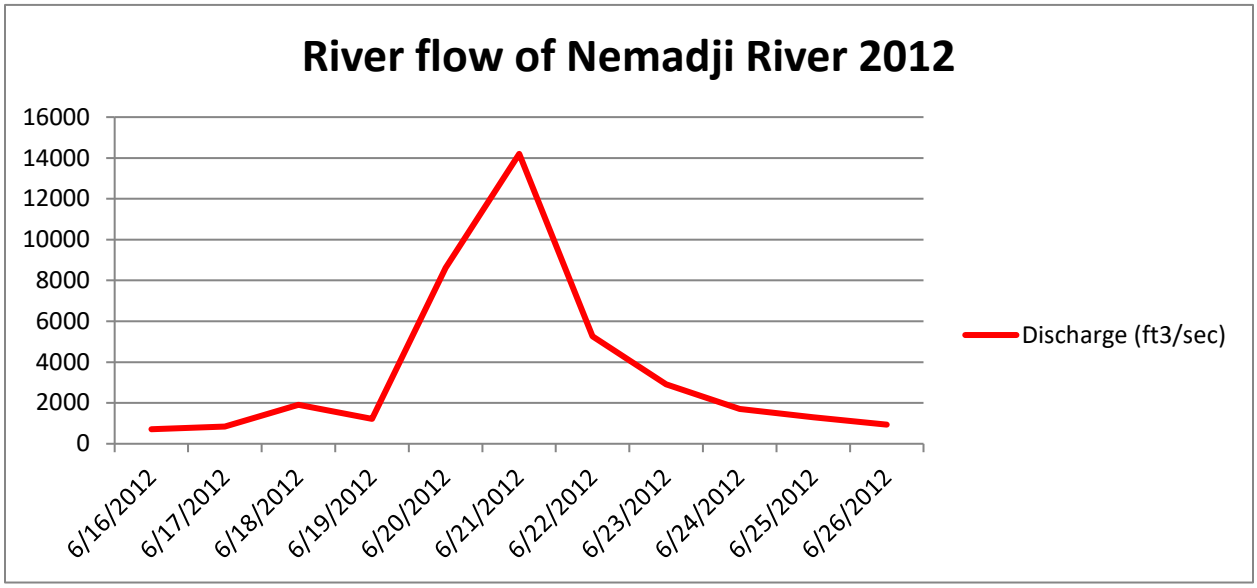
Students will be able to analyze recent Nemadji River river flow (cubic feet/second) and rainfall (inches) in Superior, WI in order to come to conclusions as to how water moves within the Nemadji River watershed, how rainfall affects river flow, why there are "lags" in rainwater appearance in rivers and will also be able to compare recent "baseline" measurements with unusual 100 year flood measurements. Below are a worksheet, student handouts with data, and Excel graphs to show students what their results were when graphed in Excel. As an extension, a table with all of the data was put together and graphed to compare rainfall and river flow between baseline and 100 year flood conditions.

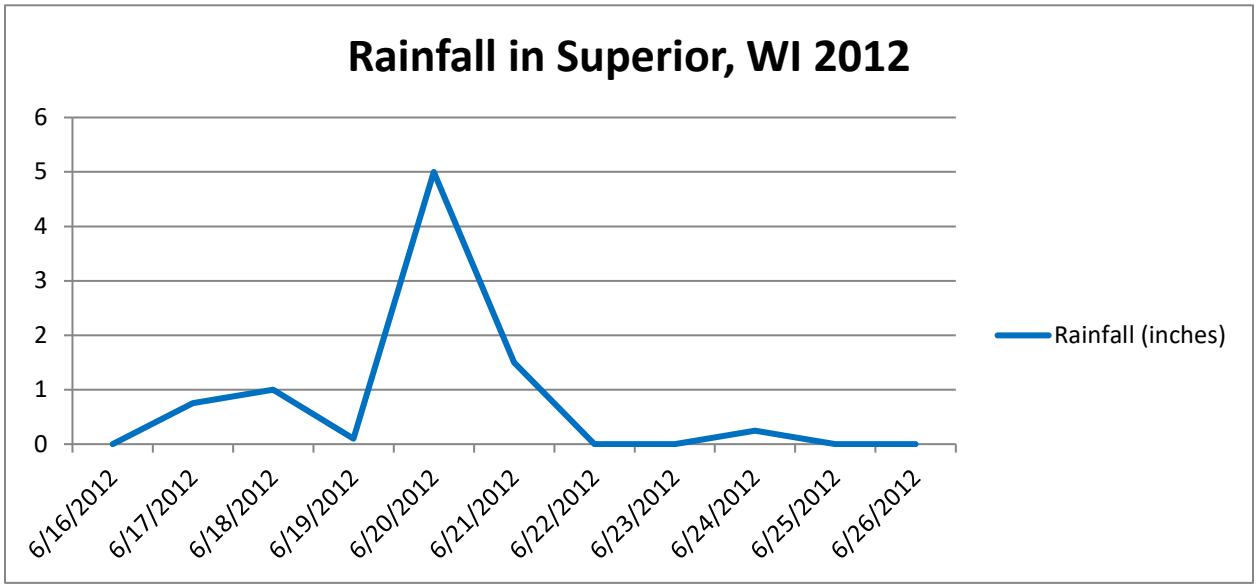
Excel graphs





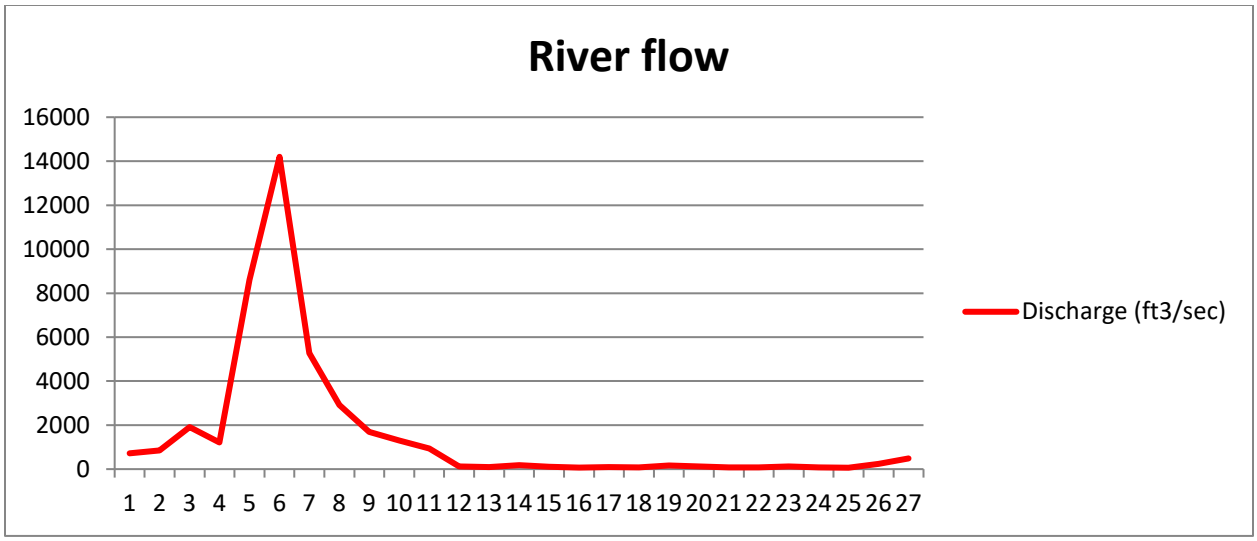
Excel Graphs

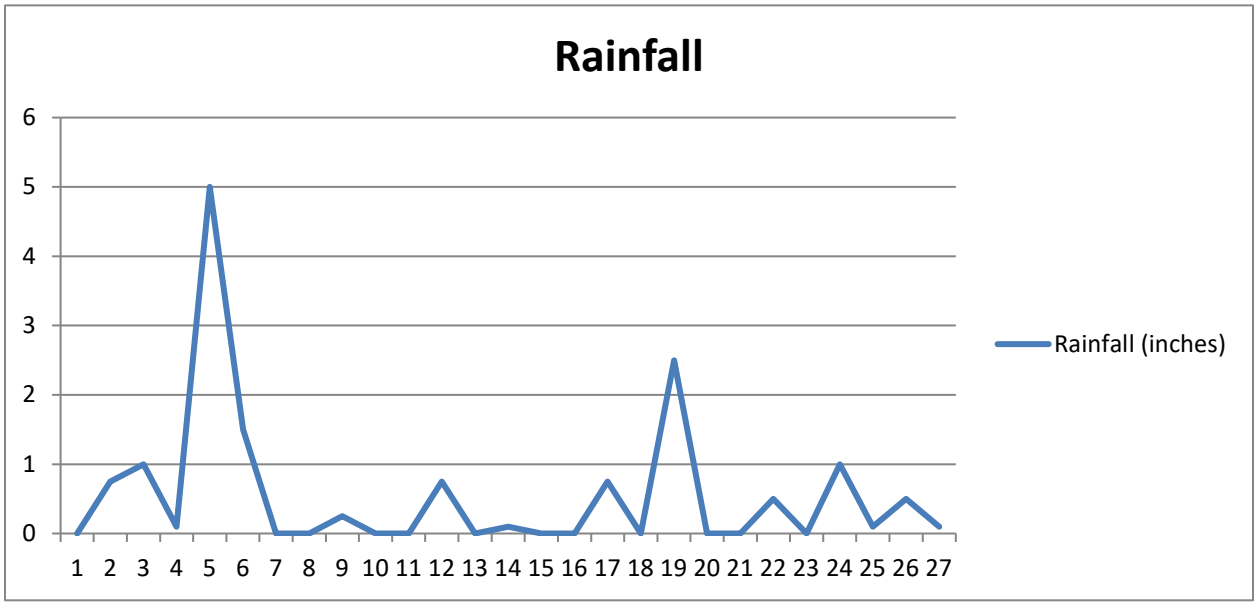




Combined data (with added numbers that correspond to location on graphs below)

Date	River flow (ft3/sec)	Rainfall (inches)	Numbers
6/16/2012	712	0	1
6/17/2012	849	0.75	2
6/18/2012	1910	1	3
6/19/2012	1220	0.1	4
6/20/2012	8610	5	5
6/21/2012	14200	1.5	6
6/22/2012	5270	0	7
6/23/2012	2910	0	8
6/24/2012	1700	0.25	9
6/25/2012	1300	0	10
6/26/2012	933	0	11
9/2/2015	117	0.75	12
9/5/2015	86	0	13
9/8/2015	185	0.1	14
9/11/2015	105	0	15
9/15/2015	70	0	16
9/18/2015	87	0.75	17
9/21/2015	72	0	18
9/24/2015	161	2.5	19
9/30/2015	121	0	20
10/6/2015	76	0	21
10/8/2015	82	0.5	22
10/10/2015	122	0	23
10/16/2015	84	1	24
10/20/2015	71	0.1	25
10/26/2015	239	0.5	26
10/31/2015	481	0.1	27


River flow
16000
14000
12000
10000
8000
6000
4000
2000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Discharge (ft3/sec)


Rainfall
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Rainfall (inches)