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by Jill Rivero, MA • Wyland Foundation Educator

Draining a Country “M.I.S.S.I.S.S.I.P.P.I - STYLE”



OBJECTIVE:

Students will learn about the draining of a nation, the United States, from its northern headwaters in Minnesota, to the Gulf of Mexico, through 4 main rivers that eventually make up what is known as the Mississippi River Watershed and Delta. Students will learn about historical efforts made to monitor the river watershed in order to prevent and to control flooding during annual, spring-time snow melts. Students will then focus on water management methods, such as building riverbank reinforcements and flood levees, and usage, such as transportation of materials and goods up and down the river, to house-hold consumption, recreational use, and industrial use in factories along the river's many waterways, and finally to agricultural run-off and types and sources of pollution finding their way into North America's largest drainage system. Finally, students will collect and analyze data provided by a Wyland Waterkeeper Volunteer of water quality tests done daily for one month from the start of the Mississippi River to the Gulf of Mexico. Students will then write up analyses of results and share/post findings with the WWV on a Facebook blog discussing any data trends, odd or outlying data points and/or reasons for these trends/random data findings.

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PURPOSE:

To educate students on historical and current river watershed management methods and usage of North America's largest drainage system, as well as to educate students of the different watersheds that ultimately feed and empty into the Mississippi River Delta. Students will participate in a month-long, live Virtual Data Collection, Discussion and Analysis of Water Quality Testing conducted along the Mississippi River from its headwaters in Minnesota to its final outlet into the Gulf of Mexico.

VOCABULARY:

North America, Mississippi River Watershed, River Watershed Management, Headwaters, Mouth, Delta, Gulf of Mexico, Pollution, Agricultural Run-off, Water Quality Testing, Army Corps of Engineers, Temperature, Turbidity, Dissolved Oxygen, PH, Ammonia

TIME NEEDED:

1 hour and 30 minutes

(30-45-minute Class Prep, Background Research and Video Viewing; 1 Lab Activity, with 2 minutes a day observations 5 times a week for 1 month, and 35 min Follow-up Lab Discussions and Facebook submissions. Facebook will have roughly 10 submissions)

TEACHER PREP AND BACKGROUND RESEARCH:

1. Visit the following websites and watch the following videos that both describe a more detailed history of the type of management practices for the Mississippi River, prior to showing the class.

<https://www.youtube.com/watch?v=JsAIDt9764Y>

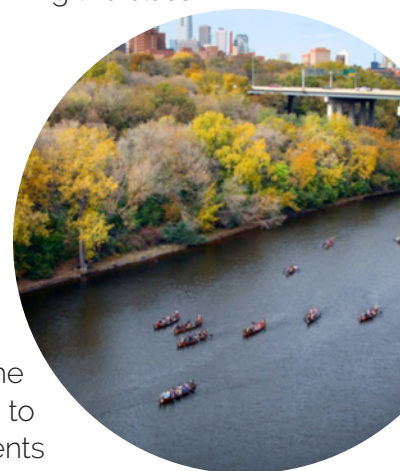
"Managing the Mighty Mississippi" (15:19 min)

<https://www.youtube.com/watch?v=qNQSdBHgit0&t=492s>

"The Mississippi River and How it's Maintained" (Documentary) (26:44 min)

CLASS PREP AND BACKGROUND RESEARCH:

1. Ask students to write down on a piece of paper or a sticky note what they think the word "Management" means. Then ask them to turn the paper over and ask them to write down silently what they think "River Management" means. Then have students pair up with another student and pair-share with each other what they wrote down.



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2. Next, in a class setting or in small groups, have students volunteer to share what they learned from each other or if there are any questions about what river management might mean. Go over the closest answers with the class as examples. Discuss next what River Watershed Management might mean? Does your particular region where you live deal with river watershed issues? In what ways? Why or why not?
3. Then, solicit from students what they think water quality testing is. Have students ever tested the quality of water before? What about visiting a river? What experiences have students had with rivers or water quality testing? Have students discuss their answer first with a classmate, limiting the discussion to one minute per student, and switching to allow the other a chance to speak as well for one minute.
4. Finally, have students watch the videos about the Mississippi River, below and discuss together as a class afterwards what they learned about rivers and the management of the Mississippi River, in particular. Allow students to discuss their answers to the question, "What will happen to the Mississippi River and the Mississippi Delta?"

CLASS VIDEOS:

<https://www.youtube.com/watch?v=-D7ZP-Uppsw>

"Mississippi River - Story of Us" (3:17 min)

<https://www.youtube.com/watch?v=e7mxKrC3Lgs>

"Mississippi National River and Recreation Area" (19:42 min)

<https://www.youtube.com/watch?v=f8qcYbswzRk>

"The scale of the Mississippi River in perspective" (1:50 min)

<https://www.youtube.com/watch?v=SrKw3N29ypA>

"Chasing the Mud: The Mississippi River Flood of 2011" (12:32 min)

<https://www.youtube.com/watch?v=8a3r-cG8Wic>

"Why Do Rivers Curve?" (2:56 min)

<https://www.youtube.com/watch?v=czd20tdEDUE>

"VIDEO: Mississippi River Rip in the Flesh" (1:05 min)

<https://www.youtube.com/watch?v=tGHAO15hROs>

"How a Delta is Formed" (3:55 min)

<https://www.youtube.com/watch?v=A47ythEc74>

"Why Do Rivers Have Deltas?" (2:34 min)



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5. Read the Introduction section below together as a class. Ask students what it means to test the water quality of a river and how that would help with management of a healthy river? What are methods in your region for keeping your rivers or waterways clean? Finally, why would the Mississippi River Watershed need managing? Why is it good to have a healthy watershed?
6. Finally, have students look up pictures on their IPADS or on a computer of a well-known waterway, river, or a watershed commonly found in your area and print pictures of them. Hang them in a central area of the classroom along with their location and local name.



INTRODUCTION:

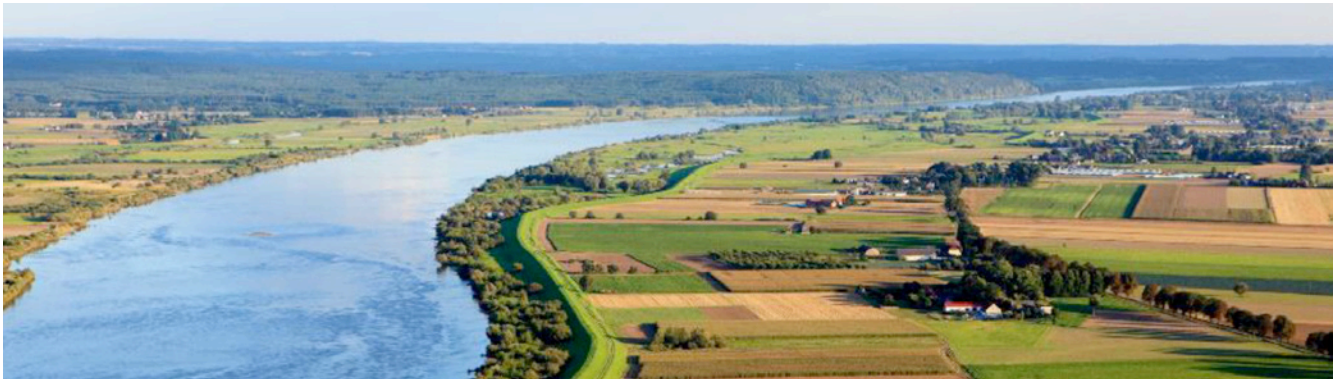
For decades, the Mississippi River has been used for the transportation of materials and goods up and down the river, for providing cities and towns with fresh water to drink and to host recreational activities in, for drainage of farmlands, and as a habitat for wildlife. All this usage has caused many negative impacts, such as polluting the river or altering its original course through attempts to control the flow or direction of the river. For example, the Army Corps of Engineers has built a complex set of locks and dams for the barges to traverse as they maneuver the river upstream or downstream. In addition, the Mississippi River is famous for flooding its banks in Spring after snow melts upriver and adds tons of fresh water that increases the volume of the river in a very short time. The Army Corps of Engineers, again, has built erosion controls such as Levees, and higher walls or reinforced river banks using concrete mats, in an effort to reduce the amount of damage a flood can do to towns, and to farmlands that want to protect their fertile soil from washing away.

In short, the management of a healthy watershed like the Mississippi River includes many groups, such as the Army Corps of Engineers, as well as groups like the USGS and Mississippi River Watch, who work together to manage and report on the water levels, water quality and cleanliness, and overall weather-conditions that affect the river itself. Finally, many more groups manage the health of the wildlife that live on or next to the river. Even with all of these coordinated attempts to work together along hundreds of miles of waterways, the Mississippi River Watershed may still be an impossible river to tame. Yet with a little education on water quality, it is still possible to clean up the river and keep it clean for generations to come.

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NAME: _____ DATE: _____ PERIOD: _____

“Muddy River: Water Quality Testing of the Mississippi River” LAB ACTIVITY



WATER QUALITY TESTING usually involves the following data collection points:

- Date and Location
- Water Temperature
- Turbidity
- Dissolved Oxygen
- PH
- Ammonia

You will be documenting data collected throughout the next month along the Mississippi River as a Wyland Waterkeeper Volunteer measures the above water quality tests. To learn more about how to conduct water quality tests, participating in the World Water Monitoring Challenge, click on the link below to view 60 second tutorial.

<https://www.youtube.com/user/MonitorWater>

View each tutorial (Water Temperature, Turbidity, Dissolved Oxygen, and PH), as well as other videos to see students around the world testing their waters. (You may also decide as a class that you want to enter data for your part of the world as you conduct your water quality tests on your own local watershed.)

Finally, follow along with the Wyland Foundation's Mayor's Challenge Facebook Blog to see water quality testing data at the following link to help you complete the following Data Table:

<http://www.wylandfoundation.org/p/mayors>

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MATERIALS (per class):

Access to Internet (Wyland Foundation Open Group- Brenan's Water Quality, Facebook Page), Data Table – Mississippi River Water Quality Test Results, 2017.

HYPOTHESIS:

The Mississippi river is a complex river ecosystem whose water changes characteristics as the river flows from the headwaters to the Gulf of Mexico.

PREDICTION:

If we record water quality tests on the Mississippi River (such as Temperature, Turbidity, Dissolved Oxygen, PH, and Ammonia), then we predict that _____ (*choose any test*) will show the largest change from the headwaters of the river to the Delta in the Gulf of Mexico. We also predict that _____ (*choose any test*) will show the most least amount of change from the headwaters of the river to the Delta in the Gulf of Mexico.

PROCEDURE:

1. Using the Data Table below, print and hand out to each group. Explain that each group will be in charge of documenting data for each water quality test taken along the Mississippi River. Their mission will be to observe the data collected by the Wyland Foundation Volunteer Waterkeeper to analyze the results for the Water Quality Testing Data posted on the Wyland Foundation Facebook Blog for the entire month.

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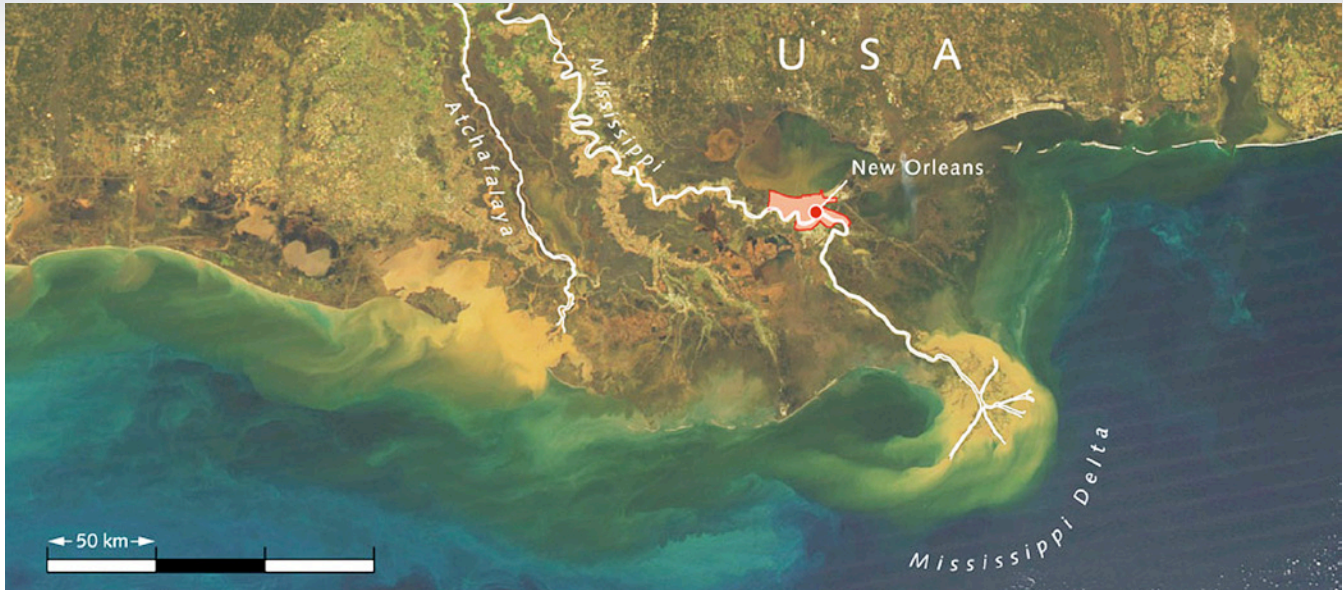
DATA TABLE: MISSISSIPPI RIVER WATER QUALITY TEST RESULTS

(Copy multiple times if needed, for collecting several weeks of data.)

Month and Year: _____

Location & Date	Water Temp	Turbidity	Dissolved Oxygen	PH	Ammonia	Additional Notes

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INTERPRETING DATA:

Water Quality Testing Raw Data:

1. Which water quality test showed the most variation? Why do you think this is?;
2. Which water quality test showed the least variation? Why do you think this is?;
3. Which location showed the highest temperature? Which location showed the lowest temperature? Why do you think this is?;
4. Which location showed the most turbidity? Which location showed the least turbidity? Why do you think this is?;
5. Which location showed the highest amount of dissolved oxygen? Which location showed the lowest amount of dissolved oxygen? Why do you think this is?;
6. Which location showed the highest PH (this means the water is more basic than acidic)? Which location showed the lowest PH (this means that the water is more acidic than basic)? Why do you think this is?;
7. Which location showed the highest amount of ammonia? Which location showed the lowest amount of ammonia? Why do you think this is?;
8. Looking at the dates from the beginning of the month to the end, was there a trend amongst any of the water quality testing data? If so, what did you discover? Why do you think this is?;

ANALYSIS:

1. What importance does water quality play in the health of a watershed? What influences water quality in a river such as the Mississippi?
2. What role does location on the river make when it comes to water quality? Why or why not?
3. What role does time of month or time of year make when testing water quality? Why or why not?
4. What do you think would happen to the quality of the Mississippi River if there were no cities along the river? Would it affect humans? Why or why not?

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Vocabulary Review:

1. What does the word "Watershed", mean to you? What do the phrases, "Water Quality" and "River Management" mean to you?
2. Review your top 3 Watershed Management Methods from the Socratic Seminar that you wrote down in Table 1 above. What environmental issues threaten your local water source/watershed? After performing this lab, is there one method in particular that people in your community can support easily?

*Bonus Questions:

1. Many states that line the Mississippi River have reported on the health issues affecting many species of wildlife living on or near the river due to pollution. What is one of these species of wildlife and what is happening to them? Use the internet to look up a species living along the Mississippi River that is experiencing health issues due to pollution from the river. What would happen if these same kinds of health issues started happening to humans living along the river as well? (You may also search for a species of wildlife in your nearby watershed that is experiencing health-related issues due to pollution as well.)
2. What solutions or other management methods could humans come up with between states that would help ensure the survival of these species of wildlife? What could you do right now from where you live?

SUMMARY CONCLUSION:

Please write a 3-5 sentence paragraph using at least 5 of the words from the word bank below. Try to describe what happened during this lab according to your data and what you learned from your data.

WORD BANK:

Vocabulary: North America, Mississippi River Watershed, River Watershed Management, Headwaters, Mouth, Delta, Gulf of Mexico, Pollution, Agricultural Run-off, Water Quality Testing, Army Corps of Engineers, Temperature, Turbidity, Dissolved Oxygen, PH, Ammonia
