

Too Much, Too Little

A Sanford Underground Research Facility(SURF) Curriculum Unit

My Science Notebook



Too Much, Too Little

Lesson One- What Is It?

Driving Question

What are the consequences of too much, or too little, water in the environment?

Your Task

- 1- Watch the video.*
 - 2- Record things you notice during the video.*
 - 3- Write down things you wonder about (questions).*
-

I Noticed...

I Wonder...



Flood, Drought, or Neither?

Home Group

- Each group member is responsible for a different picture.
- Silently look at your picture and complete this page.

My picture is (circle one): A, B, C, or D

I notice...

I wonder...

Expert Group

- One at a time, share what you notice and wonder.
- As a group, decide what your picture shows... and why.
- Work together to complete this page.

Our picture shows (circle one): Flood, Drought, or Neither

Reasons for our choice...

1-

2-

3-

Home Group

- One at a time, each group member will share what their expert group decided... and why.
- Use these two pages to record what you learn.
- Do NOT record information from your expert group on these pages. That information is written on page 4!

Picture (circle one): A, B, C, or D

Shows (circle one): Flood, Drought, or Neither

Reasons:

Picture (circle one): A, B, C, or D

Shows (circle one): Flood, Drought, or Neither

Reasons:

Picture (circle one): A, B, C, or D

Shows (circle one): Flood, Drought, or Neither

Reasons:

Discussion

What do pictures A and D have in common?

I Learned...

I Think...

I Wonder...

Too Much...

Too much water is called _____.

Example of too much water (what does it look like):

Why is picture D not an example of this?

Too much water matters because:

Too Little...

Too little water is called _____.

Example of too little water (what does it look like):

Why is picture A not an example of this?

Too little water matters because:



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Lesson Two- Where Does Flooding Occur?

Driving Question

How can patterns in Earth's features be used to predict where floods are most likely to occur?

Home Group

- Each group member should choose a map to investigate.
- Silently look at your map and complete this page.

My map is (circle one): A, B, or C

I notice...

I wonder...

Expert Group

- One at a time, share what you notice and wonder.
- As a group, answer the following questions:

What information does your map show?

List at least 3 colors from the map's key below. What does each color tell you?

What patterns do you see in the information on your map?

When would this map be useful to you?

Home Group

- One at a time, each student will share the information and patterns shown on their map.
- Use this page to record what you learn.

Map (circle one): A, B, or C

Information displayed:

Colors and their meaning:

Patterns:

Map (circle one): A, B, or C

Information displayed:

Colors and their meaning:

Patterns:

Put it Together!

- Work with your home group.
- Look for overlap in the patterns displayed on the maps.
- Answer the questions below:

What do you notice about areas that tend to flood?

1-

2-

3-

If you could build your home anywhere, but needed to make sure that it never flooded, where would you build it?

Reasons for your choice:

1-

2-

3-



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Lesson Three- When Does Drought Occur?

Driving Question

How can data be represented in graphical displays to describe typical weather conditions expected during a particular season?

Your Task

- 1- Each pair of students will receive a different data card.
- 2- Create a visual representation of your data... it does not need to be a bar graph on paper (though it can be). Be Creative!
- 3- The year, month AND season should be clearly designated.
- 4- Collaborate with your partner to answer the questions below.
- 5- Display your visual representation in the designated area.

Questions

What data are you analyzing (circle one): Temperature Precipitation

What year is your March-December data from : _____

Based on your data and visual representation, which season would you predict is most likely for drought to occur in South Dakota (circle one)?

Spring (March-May)

Summer (June-August)

Fall (September-November) Winter (December-February)

Explain your reasoning:

Gallery Walk

Collaborate with your partner as you work to answer the following questions. You will need to carefully observe ALL of the visual representations, from a variety of years, for both temperature and precipitation.

Temperature

Considering ALL of the temperature data presented, describe the typical (or “average”) conditions in central South Dakota for each season:

Spring (March-May):

Summer (June-August):

Fall (September-November):

Winter (December-February):

Precipitation

Considering ALL of the precipitation data presented, describe the typical (or “average”) conditions in central South Dakota for each season:

Spring (March-May):

Summer (June-August):

Fall (September-November):

Winter (December-February):

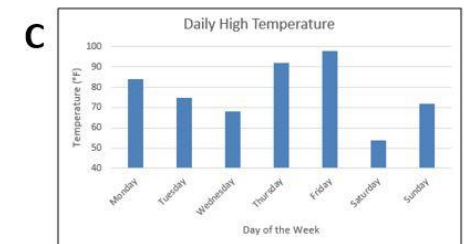
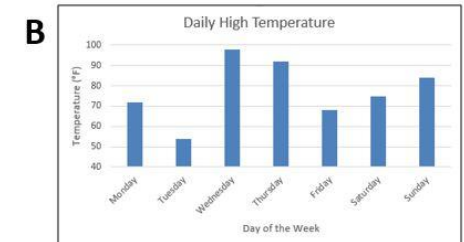
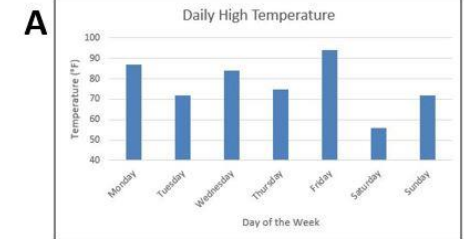
Putting It All Together

- 1) Based only on your class data, what month/season would be best for a family vacation in South Dakota? Explain your reasoning.
- 2) Based on your class graphs, what month/season do you believe drought is most likely to occur in South Dakota? Explain your reasoning.

Lesson Three Assessment

Circle the graph that best represents the data in the data table:

Day of the Week	Temperature (°F)
Monday	84
Tuesday	75
Wednesday	68
Thursday	92
Friday	98
Saturday	54
Sunday	72



Explain why:



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Lesson Four- Why Should I Be Concerned?

Driving Question

What is the likelihood of flood in Rapid City, SD?

Your Task

Without talking to your team members, review the maps from *Lesson Two*. Record (below) your thoughts on how likely it is to experience flood in Rapid City, SD.

I believe that flood is (circle one):



Explain your reasoning:

You may revise your answers (above) after group discussion, if desired!

Address the following questions with your group after your teacher shows you the Rapid City, SD pictures:

What do you believe caused the damage shown in the pictures?

What is your current prediction about the likelihood of flood in Rapid City, SD?



How does your current prediction compare with that on page 19?

What questions do you have?

Crumpled Watershed

1) Describe what you observe happening after spraying water on your watershed:

2) Explain what you think is causing what you observe:

3) The ridge lines you colored on the crumpled watershed represent the tops of hills or mountains. What do the low areas of your watershed represent?

Putting It All Together:

Collaborate with your group, using the new information and materials provided, to explain the lesson phenomenon.

1) Look back at your original thoughts on the likelihood of flood in Rapid City, SD (pg. 19). How has your understanding changed?

2) How did the physical features (landscape) of the Rapid Creek Watershed aid in causing the 1972 Rapid City flood?

3) What was unique about the rainfall on June 9-10 that helped cause the 1972 Rapid City flood? (consider amount and rate of rainfall)

Bring it Home:

1) What experiences have you had with too much water?

2) What experiences have you had with too little water?

3) How likely do you think flood is where you live and go to school?



Explain your reasoning:

4) How likely do you think drought is where you live and go to school?



Explain your reasoning:

Brainstorming Time!

In *Lesson 5*, you will investigate manmade and natural features of your hometown that reduce the effects of flood and drought. You will also work on engineering an additional feature!

Use the space below to list things you see in your hometown that reduce the impacts of flood and/or drought on humans. The first feature is filled-in for you, as an example. Mark through the first feature if you don't have one in your hometown.

Feature

What It Does

Water Tower

Stores lots of water for use in our homes

Next Steps: Look for more ideas on your way home. Ask friends and family about their own experiences with too much/too little water.



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Lesson Five- How Can We Help?

Driving Question

What can we do to reduce the impact of too much and/or too little water?

Your Task

- 1- Watch the video "Act Now Save Later".
- 2- Think about the questions on this page.
- 3- Record your thinking.

- 1) What did you notice? What questions do you have?
- 2) What “solutions” were shown for protecting people, crops, and livestock? What were they protected from?

- 3) Would any of the solutions in the video be useful in your hometown? Why or why not?
- 4) Where in your hometown is there a need for solutions dealing with either too much, or too little, water?



Engineered Solutions- Part A

Home Group

- Each group member is responsible for a different solution.
- Silently look over your solution and complete this page.

My solution is (circle one): A, B, C, or D

I notice...

I wonder...

Expert Group

- One at a time, share what you notice and wonder.
- Work together to complete this page.

Our solution helps (circle one): Flood, Drought, or Both

Questions:

1- When would this solution be useful?

2- How does this solution work?

3- What are examples of this in your hometown, if any?

Home Group

- One at a time, each group member will share what their expert group discussed.
- Use these two pages to record what you learn.

Solution (circle one): A, B, C, or D

Name:

Helps (circle one): Flood, Drought, or Both

How it works:

Solution (circle one): A, B, C, or D

Name:

Helps (circle one): Flood, Drought, or Both

How it works:

Solution (circle one): A, B, C, or D

Name:

Helps (circle one): Flood, Drought, or Both

How it works:

Discussion

Where in your hometown would any of these engineered water solutions be useful? Why?

Your Turn!



Identify the issue

- As a class, generate a list of water issues you observe in your area.
- Think about who might benefit from possible solutions.
- Would solutions to any issues cause harm?
- Are some issues more important than others?

I will work on a solution for... (What and Where)

I believe that the cause of this is... (How)

I chose this water issue because... (Why)

Generate Possible Solutions

Use the space below for brainstorming:

Top Three Solutions: (What, Where, and How it would work)

1)

2)

3)

Evaluate the Solutions

Consider the following questions as you choose the *BEST* solution (out of the 3 identified on the previous page). There is room for you to make notes after each question:

- Which solution would benefit the most people?
- Would livestock, wildlife, or the environment also benefit from any of these solutions?
- What harm might be done (to people, livestock, the environment, etc.) by any of these solutions?
- Which solution would be easiest to construct (take the least amount of time)?
- Which solution(s) would most people consider nice to look at every day?
- Which solution would last the longest length of time?
- Which solution would need the least maintenance?

Choose and Explain

The best solution is...

I chose this solution because...

People will know this solution is working when they see...



SURF Water Solutions

Challenge: Design a system for pumping water from a container on the floor to a second container 4 feet high, *using as little effort as possible.*

Supplies: Tubing (1 short and 1 long)
 2 Primer bulbs (i.e.: hand pumps)
 2 Containers for water (1 with tubing clip)
 Absorbent pad
 Variety of connectors

Planning:

- 1- Quietly think of potential solutions. As many as possible!
- 2- Share ideas, 1 at a time, within your group.
- 3- Discuss and decide which 3 ideas to test. Record below:

Idea #1:

Idea #2:

Idea #3:

Check-In: Share with your teacher for clearance to proceed.

Approval to proceed has been granted by _____
Initial Here

Investigation: Place ~350 ml of water in the container on the floor, measure 4 vertical feet for 2nd container, and begin!

Results: Record your observations below.

Idea #1:

Idea #2:

Idea #3:

Share: Follow your teacher's directions for sketching the most successful idea (make sure to include labels).

Conclusion: Compare the most successful ideas. What do they have in common? Explain WHY you think they work so well.