My Water Quality Book

by_____

My interests…

I became interested in investigating the water quality of the Pajaro River watershed since it has been discovered that blue-green algae from Pinto Lake, a place where I often spend time with my family, is the cause of several sea otter deaths. This ***cause-effect*** relationship made me wonder if I could detect additional harmful water quality factors.

Pajaro River watershed

Pinto Lake

Corralitos Creek

Pajaro River

Pacific Ocean
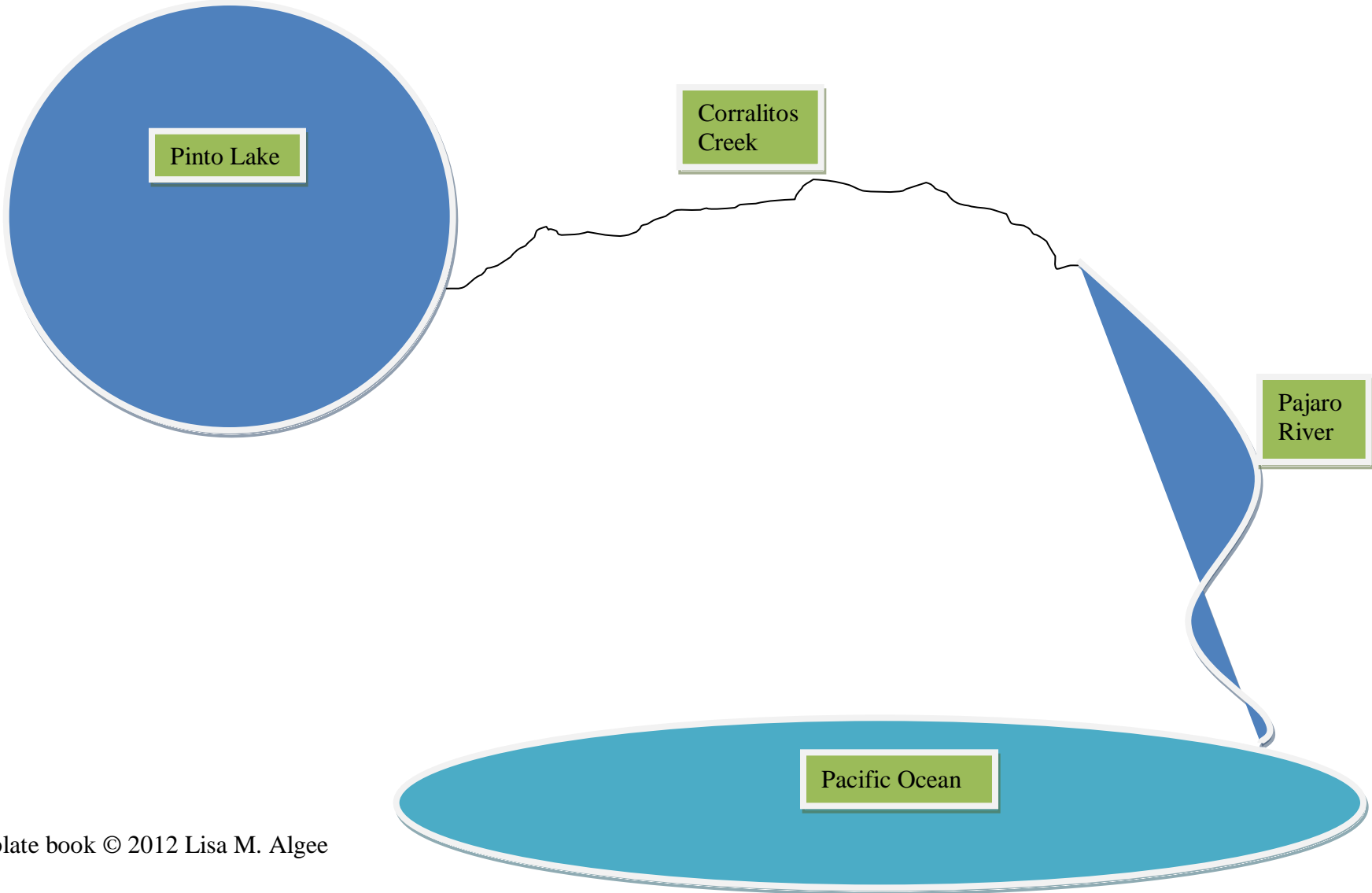
Researching information…

Curious about water quality measurements, I bought a water quality kit which provided information. From this, I discovered some interesting **facts**:

1. **Nitrate** is a nutrient needed by all aquatic plants to build protein. The decomposition of dead plants and animals and the excretions of living animals release **nitrate** into the aquatic system. Excess nitrate increases plant growth and decay, promotes bacterial decomposition and decreases the amount of dissolved oxygen (DO) in the water. Other sources of nitrate are: sewage, fertilizer, and agricultural run-off. An interesting fact about nitrate in our drinking water is that it can

affect the ability of our blood to carry oxygen.

2. **Phosphate** is a nutrient needed for plant and animal growth and is also a fundamental element in metabolic reactions. High levels of this nutrient can lead to overgrowth of plants, increased bacterial activity, and decreased dissolved oxygen (DO) levels. **Phosphate** comes from human and animal excretions, industrial pollution, and agricultural run-off.

3. The **pH** of clean water is 7, which is neutral. The pH scale ranges from 0 (acidic) to 14 (basic).

4. **Dissolved oxygen (DO)** is the amount of oxygen in the water. This varies based on many factors: water temperature (the colder the water, the more **DO** there is), the amount of vegetation (the more

plants, the more oxygen in the water), etc.

5. **Water temperature** is very important to water quality. Temperature affects the amount of dissolved oxygen in the water, the rate of photosynthesis by aquatic plants, and the sensitivity of organisms to toxic wastes, parasites, and disease. Thermal pollution, the discharge of heated water from industrial operations, for example, can cause temperature changes that threaten the balance of aquatic systems.

6. The presence of **coliform bacteria** indicates sewage or fecal contamination. It should not be found in well water or other sources of drinking water.

Research question

My research question is: What is the _____ level at:

   a. School
   b. Filtered
   c. Pinto Lake
   d. Corralitos Creek
   e. Pajaro River

Is my RQ testable?

Since I will be using tools to collect and measure the _____ level at these four locations, yes, my research question is testable.

Data collection…

To answer my research question, I will need to collect the _____ level at all sites.

    a. School
    b. Filtered
    c. Pinto Lake
    d. Corralitos Creek
    e. Pajaro River

Type of inquiry…

Of the three types of inquiry:
    (a) observation
    (b) investigation
    (c) experiment

my type of inquiry is an _____ because _____
_____
_____
_____.

Tools I need…

I realize that the **tools** I will need are:

Water quality kit
Thermometer
Rubber boots
A datasheet
Pencil

Recording my data…

I designed my own datasheet to write down (**record**) my water quality measurements.

My datasheet looks like this…

Table 1. _____ level

School	
Filtered	
Pinto Lake	
Corralitos Creek	
Pajaro River	

Our class datasheet looks like this:

Table 2. All water quality factors

	Nitrate	Phosphate	pH	DO	Temp	Bacteria
School						
Filtered						
Pinto Lake						
Corralitos Creek						
Pajaro River						

*Nitrate: 5 ppm (low) – 40 ppm (high)
*Phosphate: 1 ppm (low) – 4 ppm (high)
*pH: 4-6 (acidic); 7 (neutral); 8-10 (basic)
*DO: 0 ppm (low) – 8 ppm (high)
*Temperature: Degrees Celsius
*Bacteria: negative (red); positive (yellow)

My graph for Table 1 looks like this:

School   Filtered   Pinto   Corralitos   Pajaro
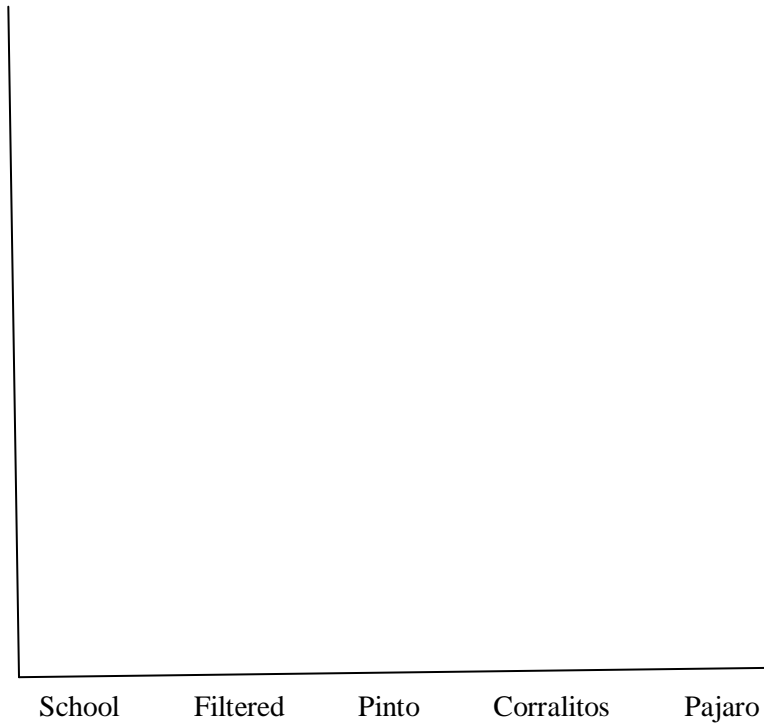
Data Analysis

(a) My **interpretation** of the data is

_____

_____

_____

_____

_____.

(b) Possible **explanation** as to why?

_____

_____

_____

_____

_____.

*(c) An **alternative explanation** is…*_____

_____

_____

_____

_____.

Conclusion…

The evidence suggests that

_____

_____

_____

_____

_____

_____

_____

_____

_____.

Present findings to the community

Report your findings

Answer questions

Compare your results with other scientists

Collaborate with scientists on another study
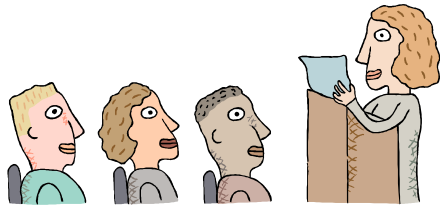
Consult with Melissa Miller DVM, who discovered (along with her team), the cause-effect link of blue-green algae and sea otter deaths.

_____

_____

_____

_____

_____

_____

_____ —

_____ .

My thoughts and feelings about doing science are…

_____
_____
_____
_____
_____
_____
_____
_____
_____.

How we can all protect our watershed:

1. Clean up Pinto Lake!
2. Don't litter, pick up trash, and recycle.
3. Support organic farmers.
4. When gardening, use non-toxic chemicals and mulch instead of fertilizer.

Next Generation Standards

Content: 3-5th

__Disciplinary Core Idea Progression:__

ESS2.E Living things can affect the physical characteristics of their environment.

ESS3.C Human impacts on Earths systems: Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Students describe things society does to protect Earth's resources and environments.

Practice: 3-5th

__Science and Engineering Practices:__

- *Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.*
- *Evaluate appropriate methods and/or tools for collecting data.*

- *Make observations and/or measurements to produce data to serve the basis for evidence for an explanation of a phenomenon or test a design solution.*
- *Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.*
- *Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.*
- *Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.*
- *Construct an explanation of observed relationships.*
- *Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.*
- *Identify the evidence that supports particular points in an explanation.*
- *Compare and refine arguments based on an evaluation of the evidence presented.*

- *Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.*
- *Respectfully provide and receive critiques from peers about a proposed procedure, explanation or model by citing relevant evidence and posing specific questions.*
- *Construct and/or support an argument with evidence, data, and/or a model.*
- *Use data to evaluate claims about cause and effect.*
- *Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.*
- *Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.*

Pre/Post for Scientific Inquiry Project

Name: _____ Grade: _____ Date: _____

1. What does it mean to '*do science*'?
   _____
   _____
   _____
   _____
   _____
   _____.

2. What do scientists do?
   _____
   _____
   _____
   _____
   _____
   _____.

3. What are your thoughts/feelings about science?
   _____
   _____
   _____
   _____
   _____.

4. When you think about a scientist, what image comes to your mind?
   _____
   _____
   _____
   _____
   _____
   _____.

5. Do you think you can do science? Explain your answer.
   _____
   _____
   _____
   _____
   _____
   _____.

Name_____ Grade____ Date _____

Students rating Water Quality Project for helping you learn _____

1 not helpful!   2 a little bit helpful   3 helpful   4 very helpful   5 Wow!

Comment:
"_____
_____
_____."

Students rating Water Quality Project for level of enjoyment _____

1 not fun!   2 a little bit fun   3 fun   4 very fun 5 Wow!

Comment:
"_____
_____
_____."

Students rating Melissa Miller's visit to our classroom _____

1 not fun!   2 a little bit fun   3 fun   4 very fun 5 Wow!

Comment:
"_____
_____
_____."