

## **SNWA Goal 1 Objective 1.2, 1.6**

### **CCSD Curriculum Essentials Framework**

#### **Science**

*It is expected that students will:*

- (4) 3.4 identify and describe various meteorological phenomena [NS 13.4.2]

#### **Social Studies**

*It is expected that students will:*

- (4) 3.10 list examples of physical and human features from the community or region [NS 2.4.1]  
(4) 3.18 describe the effects of various natural hazards on the physical environment [NS 3.4.2]  
(4) 3.23 list reasons why people move to or from a particular place [NS 4.4.2]  
(4) 4.7 recognize the ongoing nature of history

#### **Math**

*It is expected that students will:*

- (4) 5.4 use simple probability experiments to predict outcomes such as impossible, very unlikely, equally likely, very likely, certain, best chance, equal chance  
(4) 5.5 solve problems and make predictions based on collected data



**Purpose:** Students construct a model to understand how water flows across a landscape, and how floods can happen.

**Time:** Part 1, 30 minutes  
Part 2, 30 minutes  
Part 3, 40 minutes

## **PART ONE**

### **For each pair of students you will need:**

- a sheet of newspaper
- a piece of plastic wrap (approximately 50 cm by 30 cm)
- two paper cups
- a pin
- water
- blue food coloring (optional)
- basin, deep foil pan or sink
- measuring tools for water (syringe, graduated cylinder, beaker)



### **Each student will also need:**

- a science notebook or paper and a pencil

## **Introduction**

1. Tell the students, “Early pioneers came through the Las Vegas Valley on their way across the Mojave Desert because there was water here. Why do you think there was water in the Las Vegas Valley when there was so little in the surrounding desert?” Give students time to record their ideas about this question in their notebooks. Ask students to share their ideas and record a list on the board.

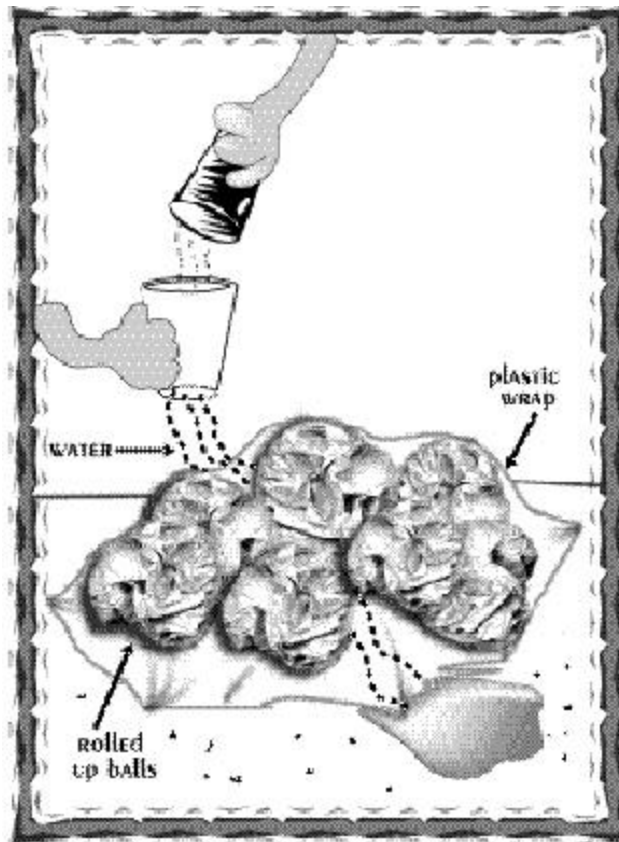
## **Making Discoveries**

### **Teacher note:**

*This activity is messy. You might want to do this in a location where water spills will not be a problem. Refer to the diagram below to assemble the models.*

2. Tell the students that they will be making a model of a valley with surrounding mountains, much like the Las Vegas Valley. They will be looking at what happens to rainwater as it falls on these land forms.
3. Have students make a landscape of mountains and valleys. Ask them to first cover the top of the basin with plastic wrap. Ask them to tear the newspaper into four pieces, each a different size. They should roll the pieces into balls and place them, one at a time, under the plastic wrap. As they place the paper balls, they should press down the plastic wrap around the ball (simulating valleys). The balls of paper should be placed close to one another to represent a mountain range.
4. Now the students should make it rain on their landscapes. Tell them to use the pin to poke many holes in the bottom of one of the cups. This cup will be the “cloud.” They should measure and fill the other cup with 100 ml of water. (If you like, add two or three drops of blue food coloring to their water to make it more visible.)
5. Holding the “cloud” over their landscape, they should pour some water into it from the other cup. (Pretend this is water that has evaporated from the surface and has condensed back into water.)
6. As “raindrops” sprinkle from the bottom of the cloud, ask the students to move it back and forth over the landscape (real clouds are always moving).
7. Students should watch what happens and write about it in their notebooks, carefully noting where the rivers and lakes formed on their

landscapes.



## Closing

8. Revisit the question you asked to introduce this activity (see step #1). Ask students to refer to the observations recorded in their notebooks to reconsider their first ideas about why the Las Vegas Valley has more water available than the surrounding desert. What are their new conclusions? They should record their new ideas in their notebooks.

## Teacher note:

*When the raindrops strike the landscape they trickle down little grooves like brooks. These brooks join together into larger streams, then into rivers. The rivers continue to run downward, off the mountains. They gather in big puddles in the valleys. The puddles, which are like ponds, grow larger and become lakes. The students should see how the rain gathers from many parts of their landscape into one big lake. The area that brooks, streams and rivers travel through to create a lake is called a “watershed.”*

## **PART TWO**

### **For each pair of students you will need:**

- the landscape model from part one of this activity
- a small amount of clay, a few pebbles, or some small plastic cubes
- two paper cups (reuse the ones from part one of this activity)
- a nail
- water
- blue food coloring (optional)
- basin, deep foil pan or sink
- measuring tools for water (syringe, graduated cylinder, beaker)

### **Each student will also need:**

- a science notebook or paper and a pencil

### **Teacher note:**

*This part can follow part one of this activity immediately, or it can be done at another time. Although it is not important to let the water from part one dry completely before going on, most of the standing water should be gone before going on with part two.*

### **Introduction**

1. Tell the students that when people began to settle in the Las Vegas Valley, they often built their homes, farms and ranches close to sources of water. Ask, “Why do you think they did that?” (They needed the water for drinking, washing and watering their plants and animals.) Ask the students to place bits of clay, pebbles, plastic cubes, etc. on their landscapes to represent early settlements. Place them close to where they observed rivers, ponds and lakes form.

### **Making Discoveries**

2. Review with the students what they saw happening to their model as it “rained.” Tell the students that while Southern Nevada only averages about four inches of rain per year, sometimes that rain can fall in a very short amount of time. “What do you think would happen if more rain fell over our landscapes, and it fell more quickly?”
3. Students should use the nails to make the pin holes in the “cloud” cups larger.

4. They should measure and fill the other cup with 200 ml of water. (If you like, add two or three drops of blue food coloring to their water to make it more visible.)
5. Holding the “cloud” over their landscape, they should pour some water into it from the other cup. (Pretend this is water that has evaporated from the surface and gone into the sky.)
6. As “raindrops” pour down from the bottom of the cloud, ask the students to move it back and forth over the landscape (real clouds are always moving).
7. Students should watch what happens and write about it in their notebooks.



## **Closing**

8. Ask students to refer to the observations recorded in their notebooks, and to share those observations with the rest of the class. What happened to the “settlements” along the rivers and lakes? Explain to the students that when too much water falls on an area too quickly we experience what is called a “flood.” This often happens in the desert at the end of the summer, when the ground has been baked hard by the sun. If the ground cannot absorb the water quickly enough, the extra water will run off. If there is a lot of water runoff, destructive flooding can begin.
9. Ask the students, “If you were an early settler in the Las Vegas Valley, where would you build your ranch? Why? (Remember, you will still need water!)”



## **PART THREE**

**For each group of students you will need:**

- small paper bag
- color tiles, 9 of one color, one of a different color (or a spinner numbered 1 to 10, or a deck of cards using only the ace through the 10 of one suit)
- 1” graph paper
- pencils
- scissors

## **Introduction**

1. Tell the students, “People in Southern Nevada often talk about disastrous flooding as a ‘100-year flood.’ Does this mean that a really bad flood

will occur only once every 100 years?”

## **Teacher note:**

*A common misconception is that a 100-year flood happens “every 100 years,” which is no more true than assuming that you will roll a 1 every sixth time you roll a die.*

## **Making Discoveries**

2. Pose this question to the students, “Suppose you are a settler considering two sites for a farm. You are told that the first place had a 100-year flood five years ago. The second place had a 100-year flood 70 years ago. You want to use mathematics to find out which place is most likely to be flood-free.”
3. Ask students to start investigating this idea by simulating 10-year floods. Have each group of students use a bag of 10 tiles, one of which is a different color from the others, to model a decade of water levels. One student should draw a tile from the bag, record its color, and return the tile to the bag. The students should do this 10 times. Each time the different-colored tile is drawn represents a 10-year flood.
4. Once the data are collected, have a class discussion and determine how many students had exactly one 10-year flood in 10 “years.” How many had zero? How many had more than one? Record this data on the board.
5. Extend the investigation to a 100-year flood. Ask each group to number 1-100 on 1” graph paper. Cut the numbers apart and replace the color tiles in the paper bag with these number slips. (Mix up the number slips in the bag.)
6. Have students simulate a century of floods by drawing a number from the bag 100 times, replacing the paper square in the bag each time it is drawn. A “100” drawn from the bag represents a 100-year flood. One member of each group should record the results of each draw.
7. Once the data is collected, have a class discussion and determine how many students had exactly one 100-year flood in 100 “years.” How many had zero? How many had more than one? Record this data on the board.

## **Closing**

8. Ask the students to explain which site mentioned in the opening scenario is most likely to be flood-free for the foreseeable future. Have them

**Word Bank**

*The teacher should introduce or review the following vocabulary with the students within the context of this lesson.*

**100-year flood:** the high-water level that one might expect, on average, once every century

**condensation:** the process of changing from a vapor (gas) to a liquid

**evaporation:** process in which the heat energy of the sun causes the water on the Earth's surface to change into a vapor

**flow:** move smoothly

**lake:** a large standing body of water surrounded by land

**pond:** a still body of water smaller than a lake

**river:** a large body of flowing water that receives water from other streams and/or rivers

**stream:** a body of flowing fresh water

**water cycle:** continuous movement of water from the oceans and fresh water sources to the air and land and then back to the oceans

**watershed:** land area from which water drains to a particular surface water body

