WYLAND FOUNDATION®

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Adaptable for 4th-6th grade

"IRRIGATION NATION"

OBJECTIVE:

Students will understand the process of irrigation and the difference between distilled water, tap water and salty water.

PURPOSE:

To educate students on the importance using water that does not contain a lot of dissolved minerals, and how using irrigated water can lead to waters high in dissolved minerals.

VOCABULARY:

"Distilled Water", "Tap Water", "Salty Water", "Dissolved Minerals", "Irrigation", "Aquaduct", "Soil Salinity", "Evaporation", "Agriculture"

TIME NEEDED:

1.5 hours (30-45 minute class prep and Introduction; 45 minute lab)

TEACHER PREP AND BACKGROUND RESEARCH:

View the following video on YOUTUBE:
https://www.youtube.com/watch?v=MQ3gpMUFPpU
"Construction of the Colorado Aqueduct to Southern California" (6 min)
https://www.youtube.com/watch?v=j1WjJTwvUVg
"Los Angeles Aqueduct Centennial 2013" (10:42 min)

CLASS PREP AND INTRODUCTION:

1. In a class setting or in small groups, have students view the animation at the following youtube link:
   https://www.youtube.com/watch?v=KDrgKxzDmn8
   "Aerial Tour of the Los Angeles Aqueduct" (1 min)

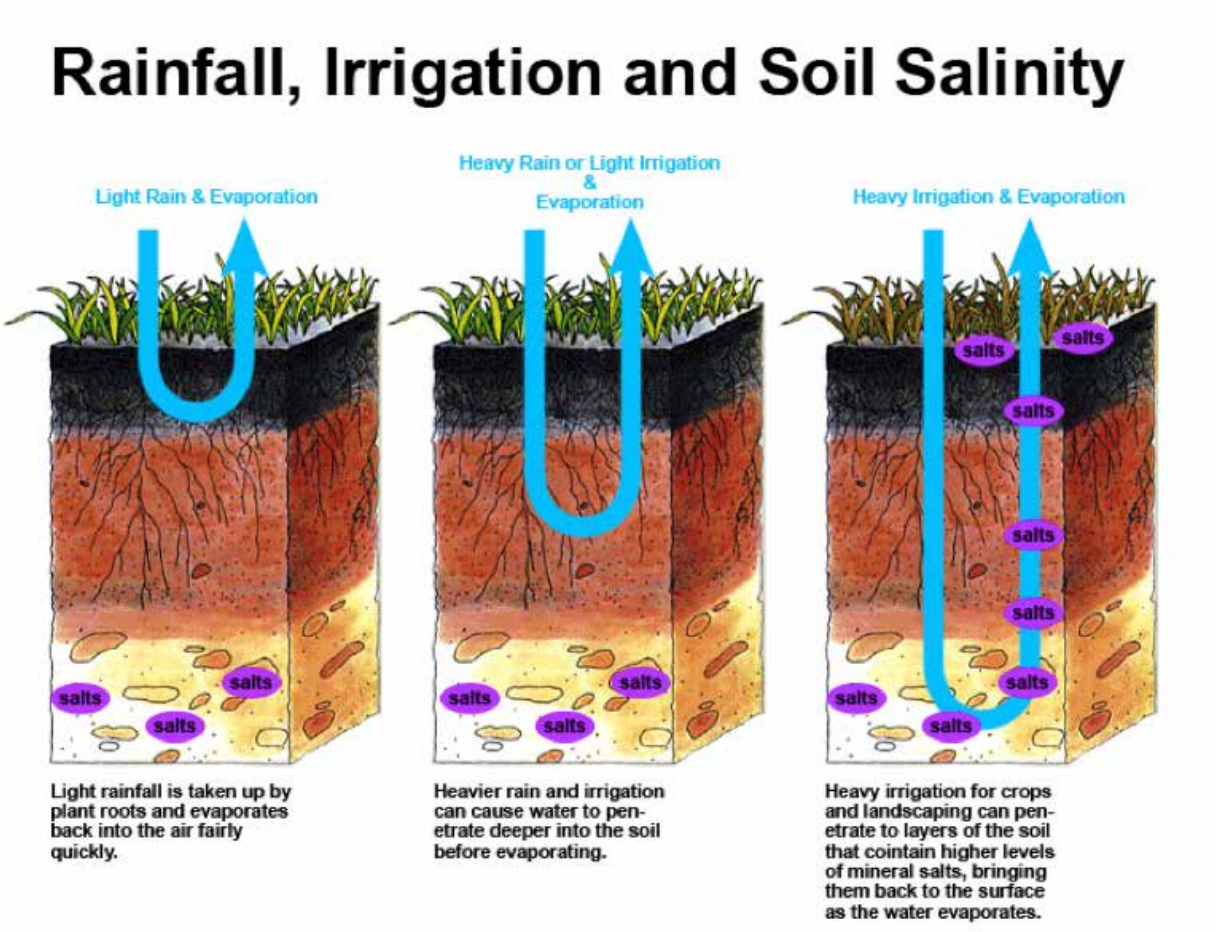
2. Ask students what they think they are looking at? Have students write their answers on a sticky note and post on a central spot in the classroom where

3. Teacher can read off to class and discuss comments. (Allow time for students to ask questions, and to discuss possible misconceptions without correcting.)
4. Now have students view the following video clips:
   https://www.youtube.com/watch?v=KKolbJSUa_I
   "L.A. Aqueduct turns 100: Delivering water to a thirsty city" (1:12 min)
   ttps://www.youtube.com/watch?v=amrCMakolKA
   "What Is Irrigation?" (2:03 min)
   https://www.youtube.com/watch?v=Q9U7Te8pxQ4
   https://www.youtube.com/watch?v=3MlxOWEYzN0
   "Saving water and overcoming salinity with conservation agriculture" (6:45 min)

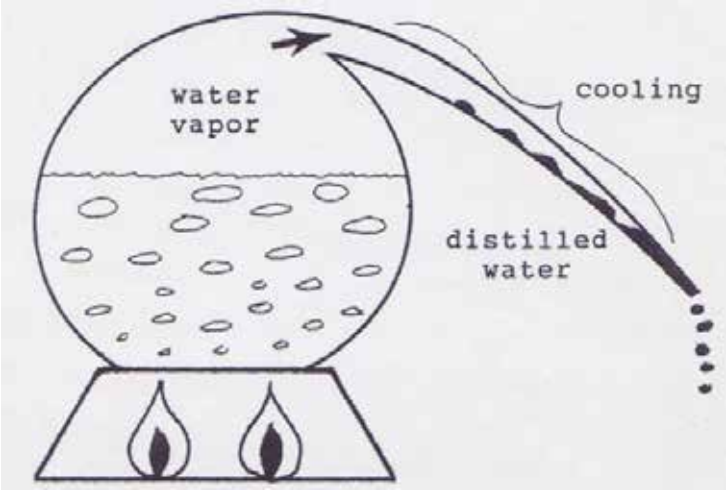
5. Read the Introduction section below together as a class and pay particular attention to the vocab terms "Distilled Water", "Tap Water", "Salty Water", "Dissolved Minerals", "Irrigation", "Aqueduct", and "Soil Salinity", "Evaporation", "Agriculture".

INTRODUCTION:

Irrigation is the process of supplying water to plants in the absence of natural watering, such as from rain. An aqua duct can help carry water in pipes and canals from one place to another, such as the California Aqua duct which transports water over 200 miles from the Colorado River to California's Central Valley, where the water can then be used to irrigate great fields of fruits and vegetables. Often times, however, when water is transported over such long distances through pipes and open air canals, the water picks up dissolved minerals, such as salts over time, and when it is finally used on soils as irrigation water, it brings with it high amounts of these dissolved minerals and salts. This can cause a rise in Soil Salinity, or the creation of salty soil. Some plants cannot grow in salty soils, and therefore the fields growing these plants become impossible to use, leaving farmers without crops to plant and can cause a huge loss in agricultural income.



One-way to overcome this side effect of irrigating would be to use distilled water, which is water captured from evaporation of regular tap water. The process of evaporation allows the water molecules to change state from a liquid to a gas, leaving the dissolved minerals and salts behind. The water vapor is then captured in a closed system and drips down into a clean container, resulting in a very pristine form of liquid water.



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NAME: _____ **DATE:** _____ **PERIOD:** _____

LAB:

MATERIALS:

(per group or as class demo): 1 shoebox, plastic tray or lid large enough to set shoebox in, plastic wrap to double wrap and line the bottom of the shoe box, 50 grams of table salt, .5 liter of tap water, 10 cups of potting soil, 1 small package of grass seeds, .25 liter of distilled water, sharpie, masking tape, graduated cylinders

HYPOTHESIS:

If we plant 3 rows of grass seed and irrigate each row differently with salty tap water, regular tap water, and distilled water, then we predict that the row of grass irrigated with _____(salty water, tap water, distilled water) will grow higher.

PROCEDURE:

1. Divide students into groups of 3 or 4.

2. Have students obtain 1 shoebox each group and double line the bottom and sides with plastic wrap to eliminate leaks. Place shoebox on a plastic tray or lid.

3. Next, fill the shoebox with 10 cups of soil, and make 3 distinct rivets or rows from one end to the other, length-wise.

4. Next, have students plant 10 grass seeds per row, careful not to have seeds touching each other, and to fill the row form one end to the other.

5. Have students create salty tap water by adding 50 grams of salt to .25 liters of taper water. Label this with tape and a sharpie, "SALT WATER". Label the remaining .25 liters, "TAP WATER". Label the .25 liters of distilled water, "Distilled Water".

6. Finally, have students water each row with water according to the table below. Have students place the shoebox at an angle about 5 cm off of the ground and prop the shoebox permanently on books or blocks, so that one side is higher than the other. This higher side will be the starting point for watering. Notify students that they to pour the water at this higher end only, and let gravity do the rest of the watering down the rest of the row. It is ok if the end does not receive water. This is part of the lab. Then place each shoebox in a sunny location where they will not be disturbed.

7.

WATERING SCHEDULE	**ROW 1 SALTY WATER**	**ROW 2 REGULAR TAP WATER**	**ROW 3 : DISTILLED WATER**
DAY 1	Add 10 ml	Add 10 ml	Add 10 ml
DAY 2	Add 10 ml	Add 10 ml	Add 10 ml
DAY 3	Add 10 ml	Add 10 ml	Add 10 ml
DAY 4	Add 5 ml	Add 5 ml	Add 5 ml
DAY 5	Add 5 ml	Add 5 ml	Add 5 ml
DAY 6	Add 5 ml	Add 5 ml	Add 5 ml
DAY 7	Add 5 ml	Add 5 ml	Add 5 ml
DAY 8	Add 2.5 ml	Add 2.5 ml	Add 2.5 ml
DAY 9	Add 2 ml	Add 2 ml	Add 2 ml
DAY 10	Add 2 ml	Add 2 ml	Add 2 ml

8. For the next 10 days, have students write down observations about each row, remarking on number of grass seeds that sprout, and color or state of the grass, as well as measuring the height in cm of the grass that sprouts. Also, have students note the state of the soil, and whether or not salt is visible on the surface of the soil, and what it looks like. Record on the Data Tables below.

ROW #1 SALTY WATER	HEIGHT (CM)	COLOR	NOTES:
DAY 1			
DAY 2			
DAY 3			
DAY 4			
DAY 5			
DAY 6			
DAY 7			
DAY 8			
DAY 9			
DAY 10			
AVERAGES			

ROW #2 TAP WATER	HEIGHT (CM)	COLOR	NOTES:
DAY 1			
DAY 2			
DAY 3			
DAY 4			
DAY 5			
DAY 6			
DAY 7			
DAY 8			
DAY 9			
DAY 10			
AVERAGES			

ROW #3 DISTILLED WATER	HEIGHT (CM)	COLOR	NOTES:
DAY 1			
DAY 2			
DAY 3			
DAY 4			
DAY 5			
DAY 6			
DAY 7			
DAY 8			
DAY 9			
DAY 10			
AVERAGES			

INTERPRETING DATA:

SALTY WATER:

1) What did you notice most about the row irrigated with Salty Water?

2) Why do you think this row looked the way it did? Did the grass seeds in this row grow higher than the other two rows, stay the same, or grow the least? (Was your Hypothesis proven correct or incorrect?) Why do you think this is?

TAP WATER:

3) What did you notice most about the grass seeds that grew in this row irrigated with Tap Water?

4) Why do you think the grass seeds grew the way they did? Did the grass seeds in this row grow higher than the other two, stay the same, or grow the least? (Was your Hypothesis proven correct or incorrect?) Why do you think this is?

DISTILLED WATER:

5) What did you notice most about the grass seeds that grew in this row irrigated with Distilled Water?

6) Why do you think the grass seeds grew the way they did? Did the grass seeds in this row grow higher than the other two, stay the same, or grow the least? (Was your Hypothesis proven correct or incorrect?) Why do you think this is?

ANALYSIS:

7) What role does irrigated water play in the role of growing plants? Were the grass seeds in this experiment able to grow very well? If not, which ones experienced difficulty with growth?

8) What role does salts or dissolved minerals play in the process of watering with irrigated water? Were the grass seeds in this experiment able to receive quality water? If not, which row experienced the most difficulty with growth, the row watered with Salty Water or the row watered with Tap Water, or were the results similar or the same? Why do you think this is?

9) What is one thing you have learned from doing this lab on irrigation with different types of water?

*BONUS QUESTIONS:

10)What would be a future experiment that you could do with irrigation to test what role water plays in the process of irrigating plants? Do you think that all plants would be affected the same way as your grass seeds? Why or why not?

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:

Distilled Water, Tap Water, Salty Water, Dissolved Minerals, Irrigation, Aqua duct, Soil Salinity, Evaporation, Agriculture