Middle East Water Treaty Negotiations for Science and Survival

Susan Hastings, McQueen High School
Grade Level – High School

Introduction

Done as a cross-curriculum lesson, science teachers can include both social studies and English departments in creating a "world-class" project that can culminate in school-wide presentations. From the science end, the lesson is inquiry causing students to study climate change and water loss issues in a notoriously dry region. Appropriate for high school and older middle school students, the lesson runs a spectrum from climate change to environmental science to geo-political. It is appropriate for earth or physical science classes and environmental science courses as well, where implemented by local school districts. It should be planned for approximately seven class periods depending on personal modifications. The application of science in a real world situation could actually motivate students to try harder and apply themselves to learning some history and international policy along with ambassadorial style negotiating and bargaining. A Power Point presentation file accompanies this activity and can be modified to fit the needs of the individual teacher.

Objectives

- To bring awareness to issue of water shortages in the world
- Students will continue to investigate properties of water and weather
- Students will understand the effects climate change has had on local climates
- To see that collaboration and cooperation with neighboring countries is necessary and requires information-gathering skills and diplomacy
- To continue refining library and research skills
- Student can work cooperatively to accomplish goals, organize as a team and present findings and conclusions in a logical and effective manner

First Day Engagement and Pre-test

Engage: Fresh versus salt water distribution. Use a graduated cylinder to fill one 1,000-mL beaker exactly and add a few drops of food coloring. This represents the Earth's entire supply of water. Use a graduated cylinder and pour 28mL of the total water into a second 1,000-mL beaker. If another 1000 mL beaker is not available, use next largest. The 28 mL of water represents the Earth's total freshwater supply. The remaining 972 mL of water is saltwater that occurs primarily in oceans. Divide the 28mL of freshwater by pouring into smaller containers: 23 mL for icecaps and glaciers, 4 mL for ground water, 0.7 mL for surface water, and 0.3 mL for the water in the atmosphere and soil.

This material is based upon work supported by the National Science Foundation under grant number EPS-0814372

A pretest is given containing content from the water cycle, focusing on river and stream systems and aquifers, and the foundation paper for the project – a 1993 paper from the National Geographic titled Water – the Middle East's Critical Resource. This article is a wealth of information on the geologic/hydrologic configuration of the area and the religious/political/ economic/political history of water usage and management in the area. Doing some work with students on the Pre-test topics is very useful in preparing them for this activity.

Water Treaty Negotiations Pre-Test

1. Source of a river or stream _____
2. Streams contributing to a larger river system _____
3. Change in slope of a river system _____
4. Rock that is a source of water _____
5. Region of a river system that diverges before emptying into a large body of water _____
6. Means of getting water from deep rocks _____
7. Area where deep waters come to the surface _____
8. Waterway that sends water from one area to another _____
9. Resource of greatest concern to people of the Middle East _____
10. Middle East Resource of greatest concern to the world _____
11. Bank that loans funds to countries for many large projects _____
12. Country at odds with other countries in the Middle East _____
13. Group of ethic people living within Iraq _____
14. Former leader of Iraq _____
15. Major river system of Iraq _____
16. River separating Jordan and Israel _____
17. Israeli water company _____
18. Leader of Jordan _____
19. Country controlling the source of the Tigris and Euphrates _____
20. Resource represented by the Israeli flag _____

a. Israel
b. United States
c. Saddam Hussein
d. Tigris and Euphrates
e. Headwaters
f. Spring
g. Gradient
h. Delta
i. King Hussein
j. Turkey
k. Water

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l. Kurds
m. World Bank
n. Mekorot
o. Oil
p. Diversion
q. Well
r. Tributary
s. Aquifer
t. Jordan River

Placement of the Lesson

Students will be familiar with these terms following a brief review of river and aquifer systems during preceding lessons on weather/climate/water cycle. We then started reading the ( ) article in class. Schools that are stressing literacy and reading comprehension want all lessons to include a component of vocabulary and comprehension. This can very easily be accomplished in this activity and can be done at the discretion of individual student teams and keep the inquiry theme going even so far as this construction of vocabulary. The following are important underlying concepts behind the full application of this activity and in order to affect total impact that it can have teachers are urged to be constantly looking for and encouraging these:

Understanding of:

- vocabulary, expressions, historical references, comprehension of ideas.
- emotional and philosophical impressions (so the students can get a feeling for the feelings and attitudes of the countries involved)
- teams are to "get into character" with the people of the country or group they represent.

There are six groups representing the following countries: Turkey, Syria, Israel, Iraq, Jordan, and the Kurds. To increase to eight groups use Lebanon and Armenia or Iran.

Day 2: Short You Tube video on water use in the Middle East.

Second demonstration showing water use comparing the U.S. with the Middle East, representing the per capita/per annum water capacity of the United States of 10,000 cubic meters with 1000ml of water (pour clear water from one 1000ml graduated cylinder into another 1000ml graduated cylinder in which I had put a couple of drops of blue dye. The water instantly turned blue – a little magic). I then did the same for the 260 cubic meters available to Jordanians by pouring 26ml into a small graduated cylinder with one drop of blue dye. The effect is stunning.

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Discussion on personal water use with comments and ideas going onto an advanced organizer on the board should be the next phase for the activity on this day. Write down all estimates for water use. Hand-out sheet with average water use from USGS. http://ga.water.usgs.gov/edu/sq3.html

Perform a "generic" student from usage of various students using the USGS web page referenced above.

Another good in-class use-test was this one based more on how much water a human needs to survive and be healthy: http://www.csgnetwork.com/humanh2owater.html

In-class quiz:

1. Which bathroom activity uses an average of twenty gallons of water?
a) shaving
b) showering

2. What percentage of overall household water use gets flushed down the toilet?
a) 10 percent
b) 15 percent
c) 25 percent

3. Where is the most water used?
a) a toilet
b) a clothes washer
c) during a shower

4. How much water does a leaky faucet waste each year?
a) 30 gallons
b) 300 gallons
c) 3,000 gallons

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5. Which uses the most water?
a) washing dishes by hand
b) washing dishes in a dishwasher

Answers:

1. a) Shaving uses an average of twenty gallons of water. Save water by filling the sink instead of running water as you shave. And by the way, five to fifteen gallons of water stream out of a standard showerhead per minute, so limit your shower time, too.

2. c) Of all the water used in the home, about 25 percent gets flushed down the toilet. Minimize flushing and check to be sure your toilet doesn't leak by adding food coloring to the tank. If it is leaking, color will appear in the toilet bowl within thirty minutes. (Flush as soon as the test is done, as food coloring may stain the tank.)

3. a) Toilets use 25 percent of a household's water consumption, with clothes washers coming in a close second at 22 percent, and showers 17 percent. Installing low-flush toilets, washing full loads of clothes, and taking brief showers with a low-flow showerhead all save water.

4. c) At one drip per second, a leaky faucet wastes between 2,700 to 3,100 gallons a year.

5. a) A water-efficient dishwasher unit uses between eight and fifteen gallons of water. If it's full when you run it, it probably uses less than you would use washing the same number of dishes by hand.

Homework – record personal water usage and go to USGS site to calculate usage. This is being turned in and graded as a separate assignment. Students are required to do the personal water usage survey and print out the results page for credit.

Anticipatory set – pour blue food coloring into bottom of large graduated cylinder. Pour water into cylinder to 1000ml. Say, "This water represents the per-capita/per/annum water capacity for the US in 1990." Then into a small cylinder with blue dye (one drop) pour 26 ml. Say, "If you were a citizen of Jordan, this represents the per-capita/per-annum water available to you."

Form groups. Reassess whether or not the team members chosen as Principal Investigators are responsible enough to be team leaders for this project. Consider consolidating some of the teams to reflect the 6 to countries and areas or be sure that existing eight teams are all strong enough and with the depth to complete this project. Based on combined pre-test scores teams decide together which country they want to represent: Syria, Turkey, the Kurds, Iraq, Israel, Jordan. Add Lebanon and Iran/Armenia if doing eight teams.

Day 3: Continue reading foundation article. This will take some time depending on the level of the students. Hand out supplementary information to leaders (articles). Leaders must keep a folio of their material and team member contributions.

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Day 4: Day in the library to begin research and organize team duties. Continue reading and start some group time. Students should be organizing their issues and requirements. If possible arrange with the Librarian to have all print resources on the Middle East and the various Middle Eastern countries

Days 5 & 6: Research in library. Students will use reserved computers, stacks, and round table room. Each group will have a round table to work together. They should have a country report done by the end of day 6.

Day 7. Go over example treaty – The Colorado River Water Agreement. Take post-test.

Day 8. Arrange desks in circle with countries areas marked out. Group leaders will be the spokespersons for their group. They will negotiate a treaty agreement. Moderator will record the terms on the active board and "publish" the final treaty.

Day 9. Put final treaty together.

Day 10. Student Presentations. (This can be delayed for a period of time if instructor wishes to grade projects before allowing students to present.)

Additional Assessment Ideas

Even though it is a high school project, some students probably have never done real research before. Some groups will attempt to cut and paste from the internet whether it makes sense or not. Some students will simply refuse to work. In order to deal with this possibility I have asked team members to sign the sections they write and team leaders to check over their team members' work and either rewrite it with their own by-line or sign it saying the person cut and pasted from the internet. This will allow the instructor to fairly assign individual grades based on the integrity of both team members and the work they did and the team leader's skills in regulating team "parasites". Teachers can also require that the member each do some presenting on the Day 10 presentations.

Encourage teams immediately after choosing countries to start doing research.

Additional instructions for teams:

You need to produce a report on the history of water needs, issues, policies, etc., of your country. Include pictures, charts, graphs, maps and all pertinent data. You should be making a list of things you want to search for in the library.

The first section of the report should be an

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introduction about the importance of the issue of water resources and management.

The next section should be a history of water issues in your country including discussion of problems with neighboring countries.

The next section should be a discussion of water resources for your country.

Finally, you should outline a plan for future needs and cooperation with your neighbors. This will be used as a baseline for your negotiations.

They are given instructions about references and suggestions about how to distribute the work.

Assign one person to research each section of the paper.

YOU MUST REFERENCE YOUR SOURCES – IF YOU DON'T THAT IS PLAGARISM AND IT IS ILLEGAL. THESE SHOULD BE LISTED AT THE END OF YOUR REPORT.

IF YOU CUT AND PASTE YOU MUST INCLUDE A FOOTNOTE.

Keep track of vocabulary. You should have a list of vocabulary at the end of your paper.

PLEASE WORK AS QUIETLY AS POSSIBLE IN THE LIBRARY.

Each group should set up at a round table so you can work together after you gather your research.

The treaty negotiations were a good exercise in cooperation and working things out. Moderate the negotiations, keep them on task and offer suggestions and advice on how to negotiate, but let them confer with their groups and decide when to do what they would agree to come to terms. This activity can approach true inquiry-based learning if executed properly. You may find that students exceed your expectations when given the goals and rewards yet are allowed to create the learning and the project themselves.

Inquiries and comments regarding this lesson can be directed to Susan Hastings, McQueen High School, 6055 Lancer Street, Reno, Nevada 89523, 775- 746-5880, or by e-mail: Susan Hastings <shastings@washoeschools.net>

References

Sources: City of Lafayette, Indiana, Utility Department; www.waterinfo.org; City of Westminster, Colorado; ConsumerReports.org. Read more: http://www.naturalhomeandgarden.com/Inspiration/2003-07-01/Water-Whiz-Quiz.aspx#ixzz1p8UdaC1s

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[Date – Day # of Project]

Discussion Questions

After air, what is the most important resource in your life?

WATER

Where does our water come from in the Truckee Meadows?

THE RIVER, WELLS, RESERVOIRS

Where does the water in wells come from?

AQUIFERS

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[Date – Day # of Project]
Get out your water use tables

Discussion Questions

What does water availability mean?

In the US the water availability per-capita is around 10,000 cubic meters

In Jordan it is 260 cubic meters.

If I represent the US water with 1000ml what is the Jordanian equivalent?

26ml

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How much water do you use in a day?

Source	Quantity	Length of Time
Bath		
Shower		
Brush Teeth		
Wash hands		
Shave		
Wash dishes (by hand)		
Wash dishes (machine)		
Wash clothes (machine)		
Flush toilet		
8 oz. water or soda		
Cooking		

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Water Use Calculation

- Go to http://ga.water.usgs.gov/edu/sq3.html

- Get your daily water usage
- If there is something they don't include, add it in afterward.

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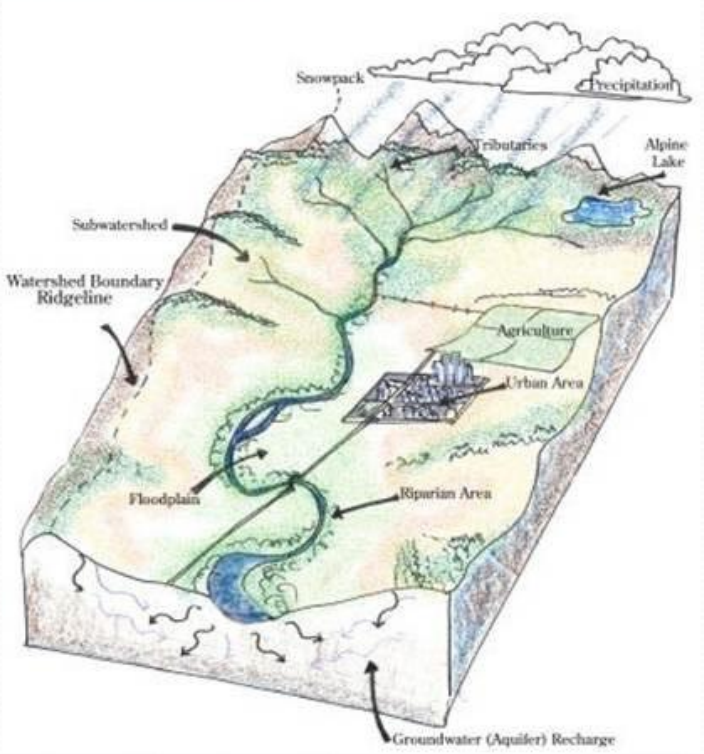
As we go through the material remember and make note –

Who controls the headlands?

- The headlands of a water system are where it all begins.
- Where are the headlands of the Truckee?

Headlands



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What are Tributaries?

What are Tributaries

- These are streams and rivers that flow into a larger river.
- What other rivers flow into the Truckee?

Tributaries

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What does the delta look like?

What is a Delta

- When a river reaches a nearly flat gradient it starts to branch out into a delta.

Delta

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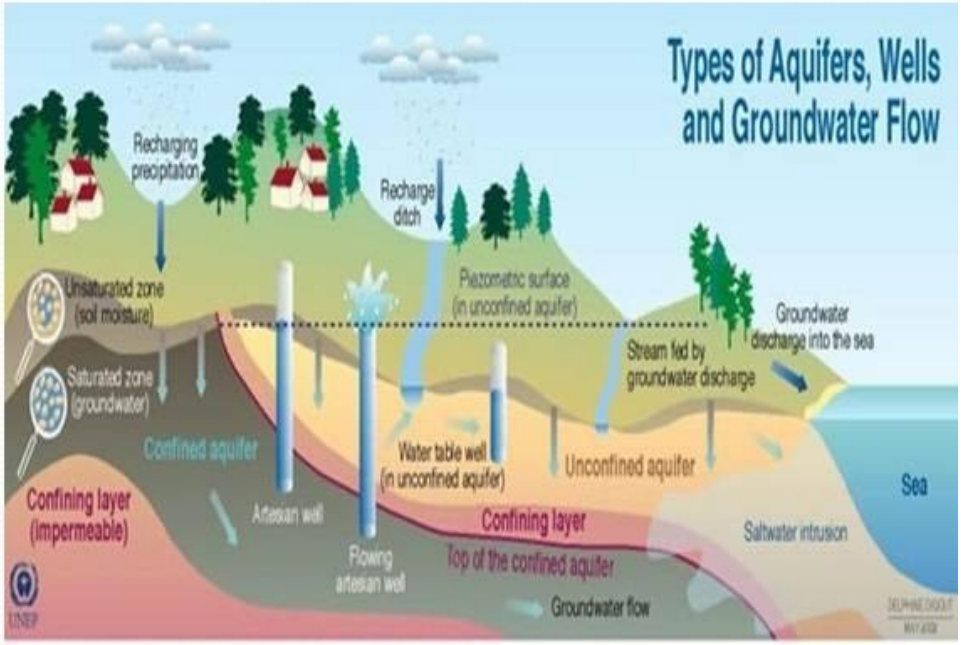
Who shares Aquifers?

What is an Aquifer?

- An aquifer is a tilted water bearing rock. It is usually recharged in mountainous areas and the water flows down slope to deeper regions.
- We draw much of our water from aquifers.

Aquifers



Source: Environment Canada, 2001 (Adapted from: http://www.ec.ca/water/index.htm).

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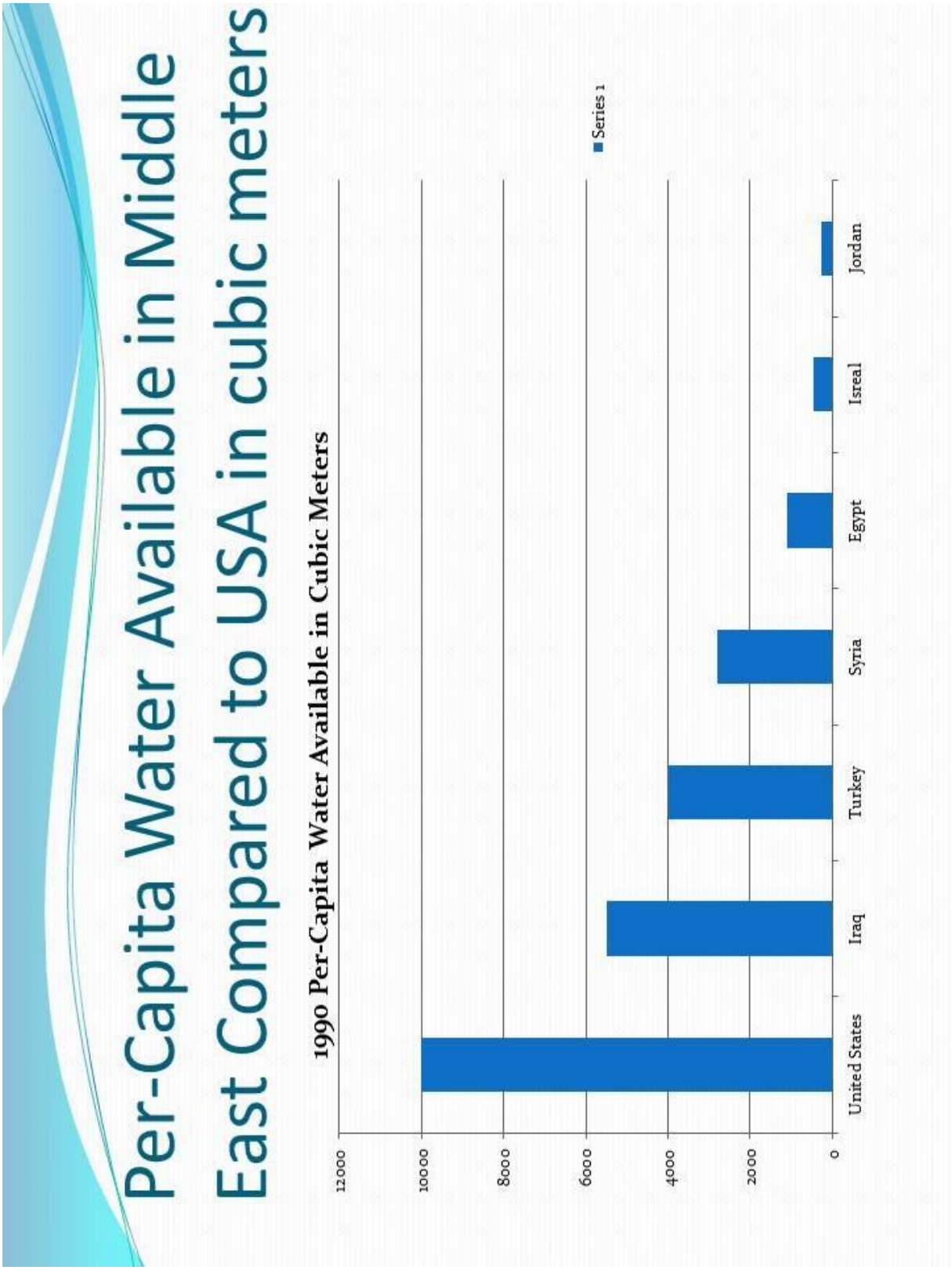

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Who Controls the Water?

We are going to divide into six groups – not exactly the same as the previous graph.

The six groups will be: TURKEY, SYRIA, IRAQ, THE KURDS, ISRAEL, and JORDAN

There will be 4 or 5 people per group.

Pick a leader.

The leader will select which country you represent.

While we are going through the article you need to pay special attention to any mention of your group and take extra notes

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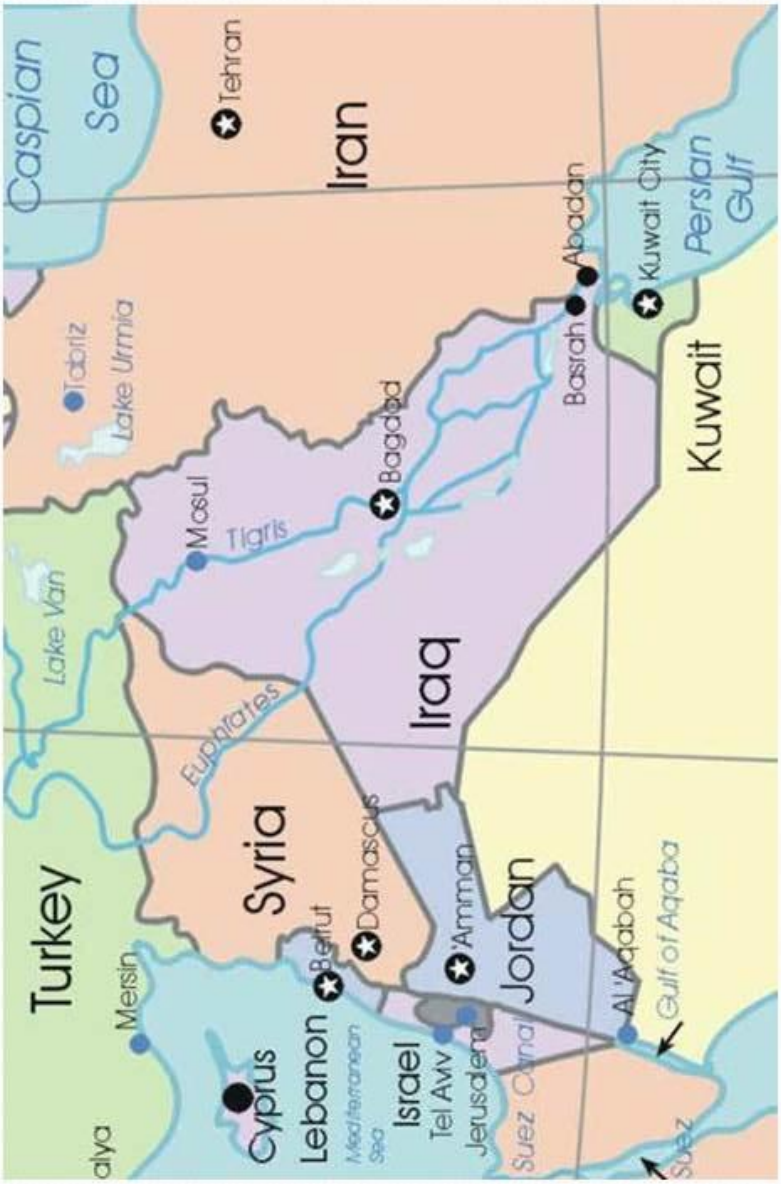
This is the Region for Your Project



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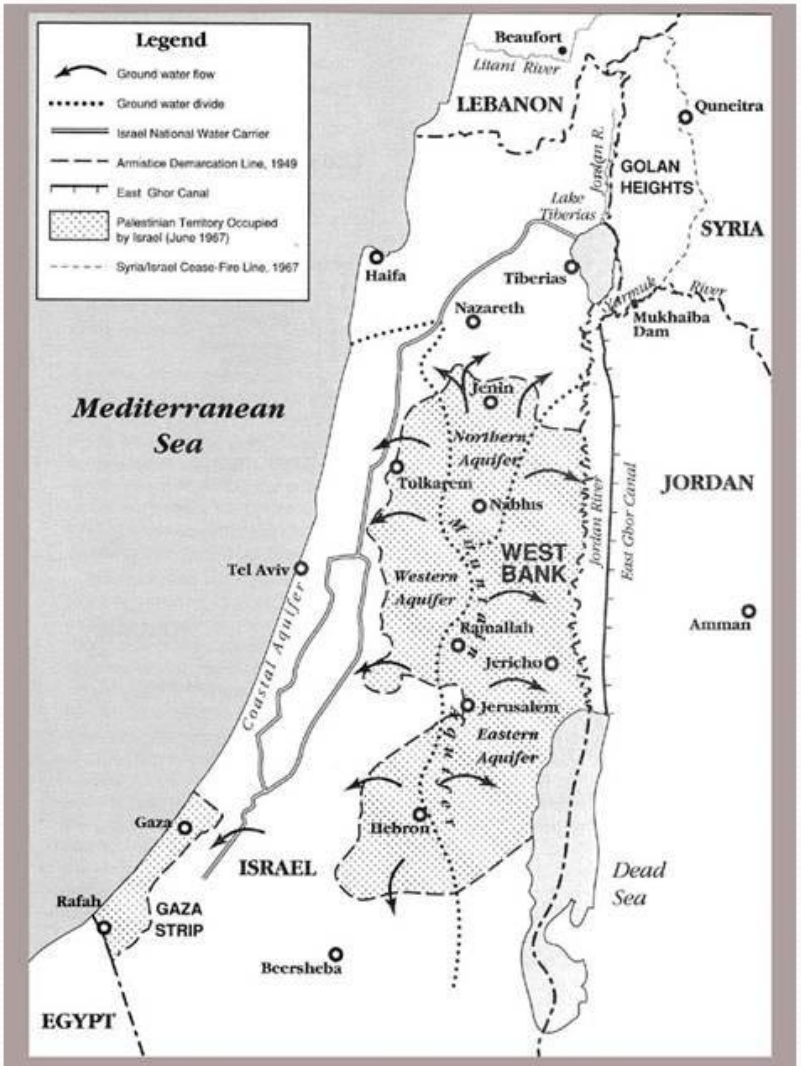
Shared Aquifers

These are the shared aquifers between Israel and Jordan.

Note they are recharged in the Golan Heights.



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What you Should be Doing

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Before You Start Your Research

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How you will be Graded

FOR AN	A	B	C	D
Words/Section	300+	250-300	200-250	<200
Maps and Illustrations	For each section	For 2 of 3 sections	For 1 section	
Photographs	yes			
Color	yes	yes		
Cover Page	yes			

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