NEW MEXICO WATER SOLUTIONS COLLABORATIVE

LESSON PLAN

SUBJECT	Earth & Environmental Science	**GRADE LEVEL**	7-12
TOPIC	Brackish Water in NM	**TIME**	50-60 Minutes

LEARNING OUTCOMES

Students will be able to:

- Define salinity and explain how it is measured (ppm, TDS, conductivity)
- Describe geologic processes that create brackish groundwater
- Analyze how climate and evaporation affect water salinity
- Evaluate challenges brackish groundwater creates for communities
- Propose scientific solutions for managing brackish water resources

WARM- UP

New Mexico has large groundwater reserves. Why do you think much of this water cannot be used directly for drinking? Students discuss in pairs and share ideas.

INTRODUCTION

Brackish water is water that contains more dissolved salts than freshwater but less than seawater. Salinity is commonly measured in parts per million (ppm) or total dissolved solids (TDS). Although New Mexico has no oceans, brackish groundwater is widespread across the state. As water moves through rocks and soils underground, it dissolves minerals such as calcium, sodium, and chloride, increasing salinity over time. In arid regions, evaporation further concentrates salts by removing water but leaving minerals behind.

Understanding brackish groundwater is critical because much of New Mexico's available groundwater is not fresh. This affects drinking water supplies, agriculture, infrastructure, and long-term water sustainability.

ACTIVITY

Materials (per group)

- 3 clear cups
- Water
- Salt
- Spoon
- Small amount of sand or soil
- Optional: conductivity meter or TDS strips

Procedure

- Cup 1:Freshwater Source. Fill with plain water and label "Recharge Water." Discuss how precipitation and surface runoff enter aquifers.
- Cup 2: Groundwater Mineralization. Add sand/soil and a small amount of salt to water. Stir and label "Groundwater Flow." Explain how water dissolves minerals as it moves through rock layers.
- Cup 3: Evaporation Concentration. Add a larger amount of salt and label "Closed Basin Water." Discuss how evaporation increases salinity by concentrating dissolved minerals.
- Students compare the cups and determine which best represents brackish groundwater in New Mexico.
- If measurement tools are available, students record salinity readings and analyze differences.

QUESTIONS

Comparison

- Which cup best represents drinking water in New Mexico? Why? Cup 1 because it has very low dissolved salts and represents recently recharged groundwater.
- Which cup best represents brackish groundwater? Why? Cup 2 because groundwater dissolves minerals as it moves through rock formations.
- How do minerals enter groundwater? Through chemical weathering and dissolution of rock materials.
- Why does salinity increase over time underground? Long residence time allows water to dissolve more minerals.
- What role does evaporation play in salinity? Evaporation removes water but leaves salts behind, increasing concentration.

Real-World Scenarios

- Why is brackish groundwater difficult to use? It requires expensive treatment before it can be used for drinking or agriculture.
- How might climate change affect groundwater salinity in New Mexico? Higher temperatures and drought increase evaporation and reduce recharge, raising salinity levels.
- What industries are affected by brackish groundwater? Agriculture, municipal water supply, energy production, and infrastructure systems.
- What solutions could help make brackish water usable? Desalination, aquifer management, conservation strategies, and water reuse.

WRAP-UP DISCUSSION

Brackish groundwater plays a major role in New Mexico's water system. As water moves slowly through underground rocks, it dissolves minerals that increase salinity. In dry climates, evaporation further concentrates salts, making much of the groundwater unsuitable for direct use. Understanding how brackish water forms helps scientists and communities develop solutions such as desalination, conservation practices, and sustainable groundwater management.

Exit Question

Why might brackish groundwater become a larger challenge in the future, and what is one scientific solution that could help manage it?

Brackish groundwater may become a bigger challenge in the future because climate change, prolonged drought, and increased water demand can reduce freshwater recharge while increasing evaporation, which raises salinity levels. As aquifers are used more heavily, water also stays underground longer, allowing it to dissolve more minerals and become saltier. One scientific solution is desalination, which removes dissolved salts from brackish water so it can be used safely for drinking, agriculture, and other needs.