

The Groundwater Game Overview and Instructions

Learn about the challenges and solution strategies of groundwater management through a fun, hands-on simulation

Time: 60–90 minutes depending on number of rounds played and length of discussion

Players: 6 players and 1 facilitator (per group)



Game overview

The Groundwater Game provides players with an interactive opportunity to experience the challenges of managing increasingly scarce groundwater when there are competing needs. The game also provides players with a greater understanding of different management tools, including groundwater trading, and fosters an awareness of the multiple interests and perspectives surrounding groundwater resources.

The tool was developed through a research partnership between Environmental Defense Fund (EDF) and the University of Michigan in response to new groundwater legislation in California. Signed into law in 2014, California’s Sustainable Groundwater Management Act (SGMA) requires local agencies to develop and implement groundwater sustainability plans to balance the supply and demand of their groundwater. Although these plans are more complex than the Groundwater Game simulation, the plans will address similar problems and may use similar policy rules.

Game play

The game has six roles assigned to different players: alfalfa grower, almond grower, broccoli grower, community water system, rural family and urban water utility. A facilitator (using the “Facilitation Script”) coordinates and tracks results on a pre-designed spreadsheet over five to six rounds of play, with each round representing a new year.



Players start each round by pumping water from the communal aquifer; this is simulated by scooping beads from a clear bowl at the center of a table and putting them into a small cup that represents a holding tank. With instructions from the facilitator, players experiment with different groundwater pumping and management strategies, including unregulated pumping and allocations based on historical use or equal shares. The game also adds in a dimension of weather uncertainty: Some players’ surface water supplies are determined by the roll of a die representing dry, average or wet water years. In later rounds, participants experience how water trading can affect water levels and see whether players’ needs are met. In the final round, the group has the opportunity to collectively devise their own management strategy.

Who should play?

Created with a variety of audiences in mind, the Groundwater Game has been played by hundreds of people, including water managers, elected officials, farmers, environmental justice groups and nonprofits. The game requires a minimum of six players. If there are more than six participants, two players can be assigned to the same role and the players can take turns scooping and jointly make gameplay decisions.

Getting started

The following materials are needed to play the game. The estimated cost of materials is approximately \$75.

1. Game spreadsheet and printed materials (Download from The Groundwater Game website).

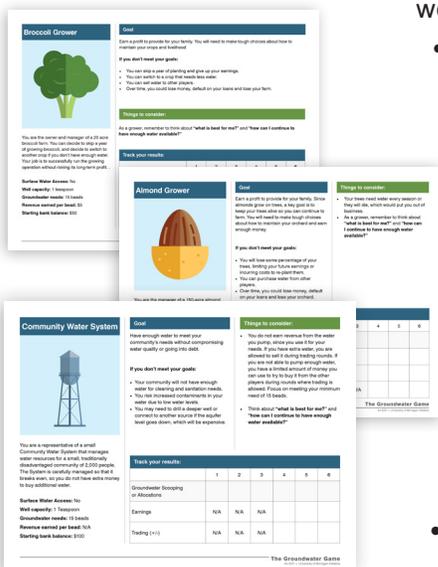
- **The Groundwater Game Spreadsheet** is where the facilitator enters game play information and game play results are displayed. The Spreadsheet has five tabs:
 - i. A 'read-me' tab which provides information on where the facilitator should add information;
 - ii. A 'set-up' tab which provides information on each of the roles, the number of beads to add to the bowl (aquifer) at the start of the game, and the number of beads for recharge;
 - iii. A 'facilitator tab' where the facilitator enters information throughout the game (number of beads scooped, surface water role, and trading information);
 - iv. A 'Results to report during game' tab that shows earnings and other game play information;
 - v. A 'Graphs' tab that graphically displays game play results.
- **The Facilitator Script** allows the game to be played with no previous training. The script is read verbatim by the facilitator and contains a description of the game rules, as well as instructions for when and how the facilitator should update the spreadsheet or take other actions.
- **Role Cards (English and Spanish)** describe the role that each player will assume for the duration of the game.

2. Laptop: At certain points during game play, the facilitator is prompted to show the players summary charts illustrating the management of their aquifer (see Game Spreadsheet – 'Results to Report during Game' and 'Graphs' tabs). If available, the laptop can be connected to a monitor or projector to more clearly display the summary charts.

3. Game materials: Gameplay requires certain physical materials, which can be obtained from a variety of retailers. Below we describe the materials required to run one game session. If you wish to run multiple game sessions simultaneously (i.e. multiple games with 6 players each) you will need additional sets of game materials.

- One 10-inch clear plastic serving bowl used to represent the aquifer. The bowl should be clear so all players can see how the aquifer level changes. *Note: You will also need a container or bag to collect beads (representing used surface water and groundwater) after the completion of each round.*

Example: Vista 10-inch Plastic Salad and Snack Bowls, <https://amzn.to/2HsL9uP>



- 1 standard six-sided die.
Example: Chessex Opaque 16mm d6 White w/ Black Dice Block, <https://amzn.to/2VA3J89>
- Glass beads: 950 blue glass beads, 3/4" size.
Example: Dashington Trade 5 Pounds – flat Cobalt Glass Marbles (2 bags), <https://amzn.to/2Hr7CZo>
- Glass beads: 25 red glass beads, 3/4" size (optional). Red beads (or beads that are a color other than blue) can be used to incorporate a water quality dimension into the game. Red beads would represent poor water quality and, if scooped, would not count towards scooping totals. <https://amzn.to/2YERXLS>
- 6 clear plastic cups for individual holding tanks.
Example: Party Essentials Deluxe/Elegance Hard Plastic 9-Ounce, <https://amzn.to/2VT51QT>
- 3 sets of measuring spoons for wells (need 3 tablespoons, 2 teaspoons, one 1/4 teaspoon)
Example: Internet's Best 4 Piece Measuring Spoon Set, <https://amzn.to/2JucSxB>
- 1 kitchen timer, with loud alarm (optional). Alternatively, a cellphone timer can be used.
Example: Habor Digital Kitchen Timer, <https://amzn.to/2WPSgCW>
- Calculators (or cell phones) to calculate earnings during game play
- Pens or pencils for note taking

Set up



- Table with chairs set up around the table (tables that allow each player to reach the bowl are ideal)
- In the center of the table place the large plastic bowl filled with 350 blue beads. OPTIONAL: If using red beads to represent water quality, fill the bowl with 325 blue beads and 25 red beads. Note: each cup holds approximately 100 beads for quick measuring.
- In front of each seat, place a role card, a plastic cup, a measuring spoon (role card indicates the spoon size to be used)
- Make sure the Groundwater Game Spreadsheet is downloaded and open on a laptop.
- Also have available printed facilitator script, timer and calculators (or cell phones), die, and pens or pencils for taking notes on role cards.
- Fill small separate bags or containers with blue recharge beads. If you are playing 5 rounds, fill four bags each with 114 beads. For 6 rounds, fill five bags each with 114 beads.