

# Groundwater Education in Hawaii

## Hawaii Department of Health Uses Awesome Aquifer Kits and JUGS as Part of Outreach Efforts

by Jennifer Wemhoff, Groundwater Foundation



**E**arlier this year, in the middle of one of the snowiest winters on record in the Groundwater Foundation's hometown of Lincoln, Nebraska, we received an order from the Groundwater Catalog for 10 Awesome Aquifer Kits and JUG (Just Understanding Groundwater) kits. I was instantly jealous of the kits, as they were headed off to say "Aloha" and help people understand groundwater in their new home of Hawaii.

For the last 33 years, Daniel Chang has been involved in environmental education and outreach, in one form or another, while working on drinking water and groundwater quality with the Hawaii Department of Health.

Chang has been instrumental in getting groundwater education tools into the hands of educators. He understands the value of groundwater as a natural resource and its finite nature.

"If we contaminate or waste this resource, we cannot go out and get more, so we need to be good stewards, use it wisely, and protect it from contamination," he said.

"Education and outreach is one way to get the message out. Knowledgeable

citizens and students are important in ensuring good quality water now and into the future."

### THE AWESOME AQUIFER KIT AND JUST UNDERSTANDING GROUNDWATER

The Just Understanding Groundwater (JUG) kit was developed by the Groundwater Foundation in the early 2000s to fill the need for an educational groundwater model that was portable, simple enough for younger students to use and understand, but customizable to be adapted for older students and even adults.

For years, Foundation staff had lugged its "ant farm" style groundwater flow model to events and demonstrations. While the flow model is an excellent teaching tool, it wasn't practical to provide to educators for classroom use or to have many students using it at once.

As they say, "Necessity is the mother of invention." And the JUG was born.

Housed in a plastic jar, the JUG is a self-contained introductory aquifer science kit. It includes activity steps for basic experiments to demonstrate aquifer geology, water movement, water pumping, and contamination.

Several years later, and after working with students and educators across the country, the Groundwater Foundation saw the need for a similar product for more advanced groundwater discoveries, and created the Awesome Aquifer Kit (AAK) as part of an event for Science Olympiad competition.

The AAK has materials and instructions for advanced groundwater experiments, including groundwater's role in the hydrologic cycle, groundwater contamination and remediation, and the physical properties of an aquifer. Its activities have been correlated to Next Generation Science Standards for even better integration into classrooms and beyond.

### GROUNDWATER EDUCATION IN HAWAII

Although it's surrounded by water as an island state, Hawaii relies on groundwater as its main source of water for drinking and irrigation. Over 500 million gallons per day of groundwater is used in the state to fulfill domestic, commercial, and industrial needs.

Groundwater provides about 99 percent of Hawaii's domestic water and about 50 percent of freshwater used in Hawaii.<sup>1</sup> Hawaii's groundwater resources

may appear plentiful, but much of the precipitation runs off to the ocean in streams or returns to the atmosphere by evapotranspiration.

Naturally, Chang wanted to help Hawaiians understand this resource.

"Working in the State's Groundwater Protection Program, we would get calls from schools to talk about groundwater in Hawaii and needed a way to explain how groundwater works to students," he said.

While looking for possible activities that he and his colleagues could use to present to students, he came across the AAK and JUG through the Groundwater Foundation catalog, and was excited about how the tools could be used.

"The interesting part of these kits was that they were simple, yet provided several activities that we could do to teach the students about groundwater," Chang explained. He said they use both the AAK and the JUG to teach students groundwater basics such as:

- What is groundwater?
- How do we get groundwater?
- How is groundwater contaminated?
- How does recharge happen?

The kits have been used in a variety of educational settings that showcase their adaptability. From groundwater displays at Earth Day events and county fairs, Project WET educator trainings, special events like the annual Make-A-Splash Water Festival conducted by the Kauai Department of Water, to direct education in classrooms with students, the JUG and AAK are helping to spread the message about groundwater.

Notably, the Hawaii Department of Health provided funding to the state's Project WET Coordinating Agency to

purchase AAK and JUG kits that were provided to educators that attended the Project WET Educator's Workshops for use in their classrooms.

They're making an impact.

"Students enjoy the different activities that we teach them using these educational tools," Chang said. "Many of them ask us when we are coming back to do more activities with them."

Other agencies have also embraced the kits as teaching tools, including Chang's Hawaii Department of Health and the Kauai Department of Water, which Chang said has spurred environmental education beyond groundwater.

He points out that in the recently completed Hawaii State Science and Engineering Fair, personnel from the Department of Health judged 20 projects related to drinking water and groundwater.

"This is a significant increase over the past 10-20 years when we were lucky to see just a handful of projects," Chang said.

#### LOOKING AHEAD

Chang has a long background in groundwater. His BS in Chemistry from the University of Hawaii led him to the Department of Health where he started doing hazardous waste and underground storage tank inspections and is currently the Section Supervisor for the Safe Drinking Water Branch.

He continues to look for new ways to bring groundwater education to people, including a Groundwater Café.

"Learning can be accomplished in many ways," Chang explains. "This year, we prepared and tested our Groundwater Café, which combined my knowledge of groundwater with my

enjoyment of cooking to put together a method of teaching about groundwater."

The Groundwater Café concept was conducted for a select group of staff from Department of Health's Safe Drinking Water Branch and Hazard Evaluation and Emergency Response Office, and showed great promise.

"We hope to hold a Groundwater Café event for Groundwater Protection Day this September, as well as a regular feature of our Project WET Educator Workshops," Chang said.

Chang knows his and his team's work isn't done when it comes to teaching people about groundwater. "While the State has made progress in our groundwater education and outreach efforts, there is still a lot more that needs to be done," he said.

Chang is excited about continuing to find new ways to deliver groundwater education. He knows that new and creative ways of groundwater education come from reviewing existing ideas and activities, creative and innovative thinking, and the sharing of ideas.

"The Groundwater Foundation has been a great resource in our efforts," Chang said.

Get your own Awesome Aquifer Kit, Just Understanding Groundwater kit, or other useful groundwater education products from the Groundwater Foundation's online catalog—shop at [www.groundwater.org/shop](http://www.groundwater.org/shop). Use promo code HAWAII to save 10% on catalog orders through July 31, 2019.💧

#### REFERENCE

1. <https://www.higp.hawaii.edu/hggcr/projects/geothermal-digital-collection/geothermal-topic-guides/water-quality-and-wells-hydrology/>

▼ Students (left) and educators (right) dig in to the Just Understanding Groundwater (JUG) and Awesome Aquifer Kits (AAK). Students work through the activities that accompany each kit to learn groundwater concepts. As part of Project WET Educator Workshops, teachers learn how to use the tools in their classrooms.

