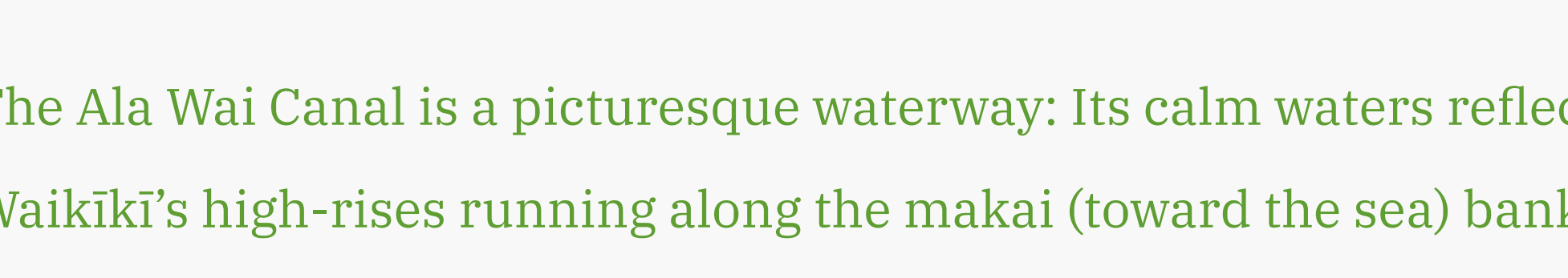


DEPARTMENT

Watershed Moment

Can tiny organisms solve big problems in the Ala Wai Canal?

Story by Catharine Lo Griffin. Photos by Shafkat Anwar.



The Ala Wai Canal is a picturesque waterway: Its calm waters reflect Waikiki's high-rises running along the makai (toward the sea) bank,

and on the opposite bank are the parks, golf courses and residential neighborhoods of Mō'ili'ili, McCully and Ala Moana.

People walk their dogs and push strollers down the palm-lined promenade along the makai bank. Outrigger canoes glide to and from the Ala Wai Boat Harbor at the canal's western end. Dug beginning in 1921, the Ala Wai began as a vision to make Waikiki “the Venice of the Pacific,” and photos from the mid-1920s show swimmers in the canal and fishermen on its banks.

But today the Ala Wai isn't the idyllic waterway it was intended to be. As Honolulu's inland population grew and forests in the valleys were felled throughout the twentieth century, runoff and silt were carried downstream, polluting and clogging the canal—so much that it must be periodically dredged, an expensive and only temporary fix.

Now there's an urgency to prepare for the likelihood that a massive storm, compounded by sea level rise, could cause the banks to overflow, a potential catastrophe for Waikiki. To mitigate this threat, major flood-control projects are being planned: dams and channels to contain water up-stream, pumping stations, catch basins and four-foot-high concrete levees.

The Ala Wai Canal is a picturesque waterway that was built in the 1920s to drain what was then a marshy Waikiki. But what began as a vision to make Waikiki “the Venice of the Pacific,” was later met with pollution from upstream development and deforestation.

But such interventions are all very expensive and disruptive. Unique among these large-scale engineering fixes is a Cinderella solution that addresses the problem at its source, literally from the bottom of the canal up. It's called the Genki Ala Wai Project, and it stars modest little mud balls—one million of them—packed with microorganisms that can digest the silt and clean pollutants. In seven years, the project organizers predict, the canal will be swimmable and fishable again.

The mud balls, or “genki balls” as they're called (“genki” loosely translates to “good health” in Japanese), contain a microbial solution developed in the early 1980s by Teruo Higa, a horticulturalist in Okinawa. Higa was conducting research on mandarin oranges when pesticides made him sick. He shifted his research to focus on natural, microbial solutions and serendipitously discovered that an aggregation of microbes including lactic acid bacteria, yeast and phototrophic (light-loving) bacteria produced vigorous plant growth. He called the mix EM, for Effective Micro-organisms. Administering EM to polluted land and waterways, he kicked off a quiet revolution in bioremediation, which has since transformed areas of environmental blight into healthy soil and clean water in more than one hundred countries.

“Instead of entropy, where everything degrades, putrefies, rots and creates disease, Dr. Higa always talks about how we can change that pathway into syntropy, which is synthesis and evolving into something more beneficial,” says Hiromichi Nago, president of EM Hawaii. Locally, EM has helped restore the hippo pond at the Honolulu Zoo and anchialine ponds at Hualālai on Hawai'i Island. It's also used by waste transfer stations and restaurants to neutralize dumpster odors. (In the wake of COVID-19, a municipality in Seoul recently sprayed EM mixed with alcohol as a street disinfectant.)

The Ala Wai's muddy waters necessitate periodic dredging, an expensive and only temporary fix. Concerned about weather events and rising water levels, the State is planning major flood-control construction projects both upstream and along the canal.

At the end of 2018, Ken Kaneshiro of the Hawaii Exemplary State Foundation, which promotes place-based STEM education to build sustainable communities, approached EM Hawaii to help revitalize the Ala Wai. Nago embraced the challenge, and the Genki Ala Wai Project was born—an opportunity to reverse the damage of a failed public works project that began more than a hundred years ago.

In the early 1900s, Waikiki was part of a lush, two-thousand-acre marsh dotted with lo'i (taro patches), springs, fishponds, duck ponds, banana farms and rice paddies. These wetlands acted as a natural filter for sediment and runoff from the streams that flowed from the upper reaches of the Ala Wai watershed, keeping the nearshore waters of Waikiki pristine.

Lucius Pinkham, the president of the Board of Health who would later become the governor of the Territory of Hawai'i in 1913, called the marsh an unsanitary breeding ground for disease. He made plans to drain it, and from 1921 to 1928, Walter Dillingham's Hawaiian Dredging Construction Company dug out the Ala Wai Drainage Canal (“ala wai” translates to “waterway”), 250 feet wide and 25 feet deep. The canal diverted the Pi'inaio, Āpuakēhau and Kuekaunahi streams from the valleys of Makiki, Mānoa and Pālolo respectively, and channeled them out to sea between Magic Island and the Ala Wai Boat Harbor. The east end of the canal, originally designed to empty out by Kapi'olani Park, was never built; the waterway stops abruptly at Kapahulu Avenue.

The material dredged from the canal was used to fill in the wetlands, creating new tracts stretching seaward to Kalākaua Avenue that were ripe for development. Newly dried Waikiki—“spouting water” in Hawaiian—began to sprout hotels instead. With urbanization came the inevitable pollution of the canal, but it wasn't immediately apparent. Photos from the mid-1920s show swimmers in the canal and fishermen on its banks. As the inland population grew, runoff flowed into the Ala Wai and deep silt accumulated.

As Honolulu's leaders ponder expensive long-term fixes, a simple, cost-effective solution might be at hand: EM, a mixture of microbes that can restore balance to polluted waterways. The microorganisms in EM can digest the silt and clean the pollution clogging the canal.

In 1935 the Boy Scouts of America honored 15-year-old Tenderfoot Scout George Alama for diving into the canal to rescue two young girls who had waded out too far. “At some points the mud is twenty inches deep so that a person diving to the bottom of the canal runs the risk of becoming stuck in the mud and drowning,” read one account of the incident. Over the next three decades, the sludge thickened, leaving only a few inches of water beneath the surface in some spots.

In 1967, following a major storm that flooded Ala Wai Boulevard and Kalākaua Avenue, the state dredged the canal. It was dredged again in 1978 and 2002, and it's currently undergoing a fourth round that will continue into 2021 and dig twelve feet below the surface. Dredging is only a short-term fix, clearly. And the hazardous sludge doesn't disappear; it's deposited into the ocean farther offshore. What about a more proactive, long-term solution?

That's what Kaneshiro is trying to coordinate among government agencies, community groups, schools, nonprofits and the tourism industry. “We're taking a much more holistic, systems-thinking approach in addressing all of the issues surrounding the Ala Wai watershed,” Kaneshiro says. “In order to do that, you have to be sure that a drop of water flowing from the top of the Ko'olau mountains—making its way through the upper watershed, the urban core, the canal and the boat harbor—reaches the coral reef in Waikiki in pristine condition.” Kaneshiro goes on to point out that water quality, public health and the economic importance of maintaining Waikiki's visitor appeal are all linked.

Ala Wai Elementary School student Wyatt Tafolo-Lin mixes EM into a “genki ball,” one of thousands to be thrown into the canal. Genki loosely translates to “good health” in Japanese, and these mud balls full of microbes were invented by horticulturalist Teruo Higa to bring just that to waterways in Okinawa.

“You have to think back. Why do we have sludge in the canal? It's because of anoxic, anaerobic conditions created by runoff from homes and pesticides and fungicides that kill off the life at the bottom,” says Nago, who along with his wife, Chikako, serves as one of the Genki Ala Wai Project's technical advisers. He points to Osaka Bay and Tokyo's Nihonbashi River as examples of polluted areas that genki balls have helped to clean up. “Each genki ball has clay soil, rice bran, EM and molasses,” Nago says. “According to the USDA, one teaspoon of healthy soil has one hundred million to a billion bacteria—soil is alive with microorganisms. Molasses is the food that allows the microbes to multiply in a genki ball. Let it sit for one to two weeks, and it gets a whitish fuzz.”

That mold, he explains, is desirable because it hardens the balls so that they sink when thrown in water. The fermented balls begin to slowly disintegrate on the bottom of the waterway. “As they break apart, the phototrophic bacteria digests the hydrogen sulfide, the ammonia—all that stinky, gassy stuff—and the fermentative bacteria digests and oxygenates the sludge. This attracts other zooplankton, phytoplankton that eat the microorganisms, and it increases the food chain. Fish and crabs start feeding off of it. They're living organisms, and they know what's really good for them.”

As soon as Jefferson Elementary School's curriculum coordinator Kelly Sutcliffe heard “PBL,” she was sold. “PBL stands for project-based, problem-based and place-based learning. I'm so passionate about any project like this. It's real-world. It's hands-on. It gets the kids involved and they're learning, but they're also seeing an impact in the community.” Jefferson Elementary and Ala Wai Elementary were the first to participate in the Genki Ala Wai Project—which makes sense because they are both adjacent to the canal. Together they hurled more than one thousand genki balls into the murky water at the end of November 2019.

Ala Wai Elementary School fourth graders and their teacher, Lori Kwee, toss genki balls into the canal. Since their development in the 1980s, Higa's genki balls have transformed areas of environmental blight into healthy soil and clean water in more than one hundred countries.

“We took them all on a walking field trip just to spark their interest, before we even told them about genki balls,” says Sutcliffe, who worked with Genki Ala Wai's education coordinator Mary Ann Kobayashi to create lessons for second, third and fifth graders. “This is a stone's throw from our school. They see how dirty it is. They see lawn chairs in there and shopping carts and rubbish and fish floating belly up. So, basically, we identified the problem and took them to observe it.”

Sutcliffe says that making the balls engaged the younger students, while the older students were fascinated with measuring pH, ammonia levels and other water quality indicators. “For comparison [to the Ala Wai water], they wanted to test everything under the sun—bottled water, tap water, their Hydroflask water, everything,” she says. The fifth graders went on to present the project at the district science fair. “Then they took it a step further: They made genki ball launchers—catapults and slingshots—to make sure the balls were getting to the other side of the canal. That was really cool.”

Ala Wai Elementary fourth grade teacher Lori Kwee shares Sutcliffe's enthusiasm. Kwee's students helped preschoolers to roll the earthy ingredients into solid, soft-ball-size orbs. “I saw so many smiles, so much messiness, which is part of learning, right?” Kwee says. “They learned about the natural, good bacteria that is going to break down the bad bacteria, and they were excited to be activators—to be citizen scientists who are a part of cleaning the canal.”

“All of us want to help the environment,” says one of Kwee's students, Eseta Tatafu. “What makes our project so special is that we did this as a team, and that makes me feel really good.”

“I'm a sucker for this kind of life-lesson stuff,” says Genki Ala Wai Project Director Ian Pelayo, who is also an eighth grade science teacher. “When you look at the Ala Wai Canal, it looks so messed up that you feel like you can't do anything about it. But I want the project to show that even if it seems like a crazy goal, you can make improvements.”

Since the inception of the Genki Ala Wai Project in 2018, data shows that the balls are working. Most notably, the sludge is disappearing and wildlife is returning. One spot filled with 13.5 inches of sludge was found to have only two inches after just two months of treatment.

At GenkiAlaWai.org, data collected by the students and the Hawai'i Department of Health tracks how the ecosystem is changing following last year's ball toss (and, at the Jefferson Elementary site, an additional application of EM liquid in January). Most notably, the sludge is disappearing. At one spot it was 13.5 inches deep before genki. Three months later it was only two inches deep. The Jefferson Elementary site at the canal's Kapahulu end showed remarkable improvement in water quality, with reduced turbidity; higher dissolved oxygen levels; reductions in ammonia, nitrites and nitrates; and a 27.5 percent drop in enterococci bacteria—which indicate the presence of fecal matter—from 697 cfu (colony-forming units per 100-milliliter sample) to 192 cfu (130 cfu is considered acceptable).

A photojournal on the web site documents the surprising progress on this “stagnant” part of the canal over a six-month period:

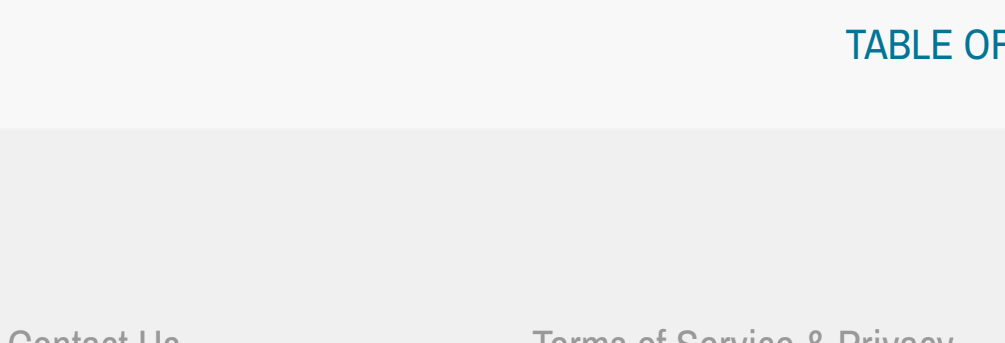
- Nov. 27: Genki ball toss
- Dec. 6: Visible sand. Large rock covered in sludge. No fish.
- Dec. 12: Same large rock with sludge digested. Fish return.
- Dec. 12: Heron returns to feed off fish.
- Jan. 19: Ducks drink and bathe following EM application.
- Jan. 28: Canoe club volunteers cut back shrubs.
- Mar. 5: Water clarity allows sand to be seen.
- Apr. 27: Mother duck and ducklings return to the site.

“One of the most amazing observations was seeing weede [goatfish] all the way at the back end,” says Kaneshiro. “Without the silt layer on top, the fish can feed on the crustaceans in the sand. That's a positive result in a very short period of time with a pretty small effort—Jefferson Elementary just doing that one toss. Imagine if we did that along the whole canal.”

At the Mālama Ala Wai Community Fair just before Earth Day last year, Governor David Ige and Polynesian Voyaging Society master navigator Nainoa Thompson joined a group of Punahou School students in a ceremonial genki ball toss from the deck of *Hōkūle'a*, the double-hulled voyaging canoe that had recently returned from a worldwide sail to promote environmental responsibility. Using the Ala Wai as an example, they wanted to demonstrate that community resource management is critical to protecting watersheds everywhere.

This year the threat of coronavirus forced the Genki Ala Wai Project team to cancel an Earth Day event, but their vision is not diminished. Next year marks the canal's hundredth anniversary, and Fumiko Sato Chun, the project's media liaison, says they're planning to expand the school programs and host workshops to teach the public how to make genki balls. One million balls is a colossal number, but Sato Chun, who saw how millions of genki balls helped restore the Dōtonbori River in Osaka where she grew up, believes it is absolutely attainable.

“What I love about this project is that it's a mud ball made with ingredients you can find in your kitchen,” she says. “Kids are so used to being shown solutions that are in a package already, and then they get this rice bran and soil and they're like, ‘What are we making?’ They experience this organic way of cleaning up their backyard.” On a recent site visit, she observed 'o'opu (native freshwater gobies) in the canal, which reassured her that the dredging and spring rains didn't entirely dilute the effects of the genki balls. “They are still holding up. They are still doing the work, those little miracle mud balls.” [HH](#)



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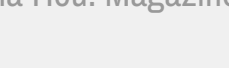
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