



ZERO WASTE REVOLUTION

2016-2017 School Year

MONTHLY REPORT • NOVEMBER

Now we are **THREE**

Lanikai School's Resource Recovery program is familiar to everyone on campus and largely settled for now. The cyclical schedules, the repetitive procedures and protocols have become routine.

The next step is expansion of the Lanikai Model to other schools. Representatives from over two dozen campuses have visited Lanikai over the last 18 months to get information and ideas they can take back with them, but only a handful have grasped the power and beauty of the comprehensive, fully-integrated, productive ecosystem created at Lanikai, and plan to find a way to replicate it.

The addition of two part-time staff courtesy of KUPU has made it possible to spread our wings and share our knowledge, experience – and most importantly, our helping hands – elsewhere. This program requires *bodies*. **People** to do the work.

In August, following their Food Waste Audit, we assisted **Ka'elepulu Elementary** to set up a cafeteria Separation Station and start a composting operation. With continuing help from our interns and other community support, they have successfully diverted and processed 100% of their food waste since then.

In November, **Kainalu Elementary** asked Lanikai to conduct a Food Waste Audit to obtain the data they need to decide how to proceed beyond their worm bin. KUPU interns and school volunteers held the audit and built a hot compost pile. *They are on their way*. The Kainalu report is printed in full on the following pages.



Kainalu students quickly picked up the sort-and-separate protocol during a two-day Food Waste Audit.



Interns Tawni Kerr and Samantha Luhn poke chimneys in the hot compost pile they built to accommodate food waste collected during the audit – a total of 488 pounds.

FOOD WASTE AUDIT Kainalu Elementary School

November 28 & 29, 2016

A **Food Waste Audit** was conducted for two days at Kainalu Elementary – courtesy of Lanikai Elementary Public Charter School – to determine baseline data for the school’s Resource Recovery initiative. This project was proposed by parent volunteer **Fe Bailey** with full support of administration, associated faculty, custodial, kitchen and cafeteria staff.

Kainalu has a student population of 460, with 220 participating in the National School Lunch Program. Approximately 50 students also eat school-provided breakfast. Breakfast is served 7:15 to 7:45am. Students are served lunch in three shifts starting at 11:00am. At each shift, students are dismissed by table, so it is relatively easy to control the flow of kids passing through to sort their lunch trays.

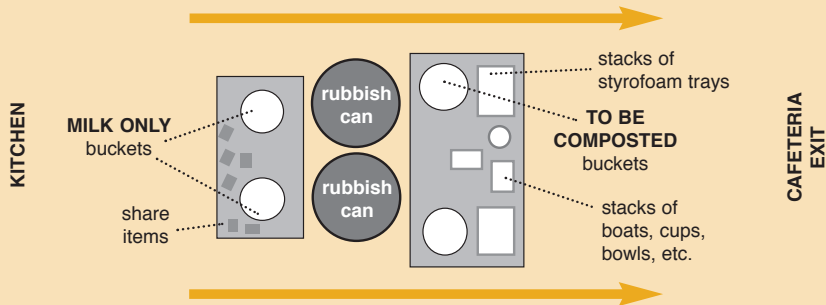
Breakfast and lunch are prepared on site, so in addition to post-consumer plate scrapings there is some kitchen prep waste and a small amount of surplus generated. This resource was included.

Food waste from breakfast and lunch was sorted and weighed for two days and averaged. No food waste was collected from the Teachers’ Lounge, around the campus, nor from the after school program.

SEPARATION STATION SET UP

To conduct the waste audit, a double-line Separation Station was set up in the cafeteria as diagramed below. Students enter the station from either side.

- First, leftover milk goes into the **MILK ONLY** buckets. Unopened milks and juice boxes can be left on the share table for someone else to take if they wish.
- Milk cartons, forks, napkins, ketchup packets and other rubbish is deposited into the rubbish can.
- Food waste is tipped into the **TO BE COMPOSTED** buckets, and...
- Styrofoam trays and other food service items are stacked on the table.



Between shifts, the contents of milk buckets was poured into closed buckets and set aside and full food buckets were replaced with empty ones. The stacked trays and other items were placed in the rubbish cans (“if you stack ‘em, you can pack ‘em), and the full rubbish bags taken out to the dumpster and replaced with new ones.

RESULTS

Buckets are weighed with a hanging scale. Note: One gallon milk = 8 pounds.

Monday, November 28

Breakfast

food: 12 pounds

milk: 8 pounds

Lunch

food: 135 pounds

milk: 47 pounds

Total food: 147 pounds

Total milk: 55 pounds

Total

post-consumer: 202 pounds

Prep 23 pounds

Surplus 40 pounds

TOTAL

RECOVERED: 265 pounds

Tuesday, November 29

Breakfast

food: 27 pounds

milk: 13 pounds

Lunch

food: 131 pounds

milk: 43 pounds

Total food: 159 pounds

Total milk: 56 pounds

Total

post-consumer: 214 pounds

Prep 8 pounds

Surplus 0 pounds

TOTAL

RECOVERED: 223 pounds

Daily waste:
244
pounds

From these two representative samples, daily food waste from the kitchen and cafeteria averages **244 pounds**. This is consistent with results from similar DOE schools with their own kitchens and the same number of National Lunch Program participants.

At this rate, in a 180-day school year, Kainalu Elementary School generates 43,920 pounds of food waste, just under 22 tons.

By sorting out milk and food, plus stacking trays, cereal bowls, boats, and other food service items, the number of rubbish cans filled for the day was reduced from 13 to only 5.

All 488 pounds of food/milk waste collected during the waste audit were layered with tree mulch in a hot compost pile that was established opposite the 5th grade classrooms along the fence line. This pile can be added to up to 1,000 pound of food waste, then allowed to process for six months. Approximately 2.5 cubic yards of rich compost can be harvested at the end of the breakdown cycle.

RECOMMENDATIONS

First, register with the EPA

Register with the U.S. Environmental Protection Agency's Food Recovery Challenge at <https://www.epa.gov/sustainable-management-food/food-recovery-challenge-frc>. You will be asked to submit your baseline data and state a goal for this school year for reducing food waste. This competitive and informational program provides incentive for keeping on track and connects your school to thousands of others throughout the country who are also exploring ideas and strategies for recovering food waste. Hawaii has a strong record of achievement: Pearl City High School was the top winner for the 2013-2014 year in the category of Schools K-12, and Lanikai Elementary Public Charter School was named #1 in the nation for 2014-2015.

Consider collection and composting one day a week

At this time, Lanikai School has one full-time paid Resource Recovery Specialist and two paid KUPU interns who can commit to helping Kainalu recover and process food waste for *one day a week*, either a Monday or Tuesday (which can alternate).

From the roughly 244 pounds of food waste collected that day, 30-35 pounds will be set aside for the worm bin and the rest will be hot composted. This one-day Kainalu Resource Recovery staff will set up the Separation Station for breakfast, monitor collection, clean up, and return to do the same for lunch. They will build and maintain the compost piles, and collect and record data on all operations. Parents, community volunteers or even student helpers would be welcome to assist in any part of the operation.

Processing 244 pounds via worms and hot compost comes to 9,760 pounds of food waste in a 40-week school year, a landfill diversion rate of 22.7% of the total. That's nearly 5 tons! That would be a realistic goal for Kainalu's first year. Eight compost piles would be constructed over the year, yielding approximately 20 cubic yards of finished compost.

While 100% waste diversion is ideal, the resources to support it do not exist at this time. An operation in the 22-ton range would require two paid Resource Recovery Specialists on campus for four hours (eight staff hours) daily.

Consider a daily Separation Station

The single most important aspect of the Resource Recovery operation that impacts students is the Separation Station, whether or not food waste is processed daily. The sort-and-separate protocol is one all students should learn, practice, and perfect. If volunteers can be found to set up, monitor, and clean up the station, this procedure should become the new normal for your cafeteria.

Separating one day and throwing food waste in the rubbish can on other days is confusing and sends a mixed message. In addition, if food waste is separated out, you have the option of finding a piggery to take it – this still counts as recovery! If food must be disposed of it can be more compactly boxed. Discarded milk can be poured down the drain. Dumpster volume will decrease from 13 to 5 rubbish bags daily.

START-UP COSTS

The Kainalu Resource Recovery staff is courtesy of Lanikai School and KUPU. If you wish to proceed, you will need to purchase your own supplies and equipment for both the Separation Station and the composting operation. Lanikai School purchased buckets, a scale, a tarp and bricks to loan Kainalu for the Food Waste Audit. You can buy these items immediately from Lanikai at the same purchase price.

All recommended items are listed. You may already have some items on the list, such as a wheelbarrow, pitchfork, or hoses.

Separation Station

Two (2) 4-foot low tables* @ \$45	\$ 90.00	(we used what you had on hand)
Nine (9) TO BE COMPOSTED buckets \$25**	225.00	
Two (2) WORM FOOD buckets @ \$25**	50.00	
Two (2) MILK ONLY buckets at \$11	22.00	
One (1) hanging scale	10.00	
	<hr/>	
Subtotal	\$397.00	

Composting Operation

One (1) wheelbarrow	\$ 40.00	
Two (2) pitchforks @ \$40	80.00	
One (1) lightweight hose extension	18.00	
One (1) 9' x 9' tarp ***	12.00	
Ten (10) bricks @ \$1***	10.00	
	<hr/>	
Subtotal	\$160.00	

TOTAL approximate start-up costs \$557.00

*The adjustable height tables are the best to accommodate kids, but they are hard to find. City Mill gets them in from time to time. You can use for now whatever you have around.

** These buckets are specially modified to meet all DOH and Food Safety regulations

*** One tarp and ten bricks will be needed for each compost pile.
Estimated eight piles will be built in one year.

Other community outreach

Palolo Elementary vermicast harvest

Ms. Mindy had little hope that the Palolo Elementary worm system would ever rise again after a long roller-coaster history of chronic failures and disappointments, but was happily proven *dead wrong!*



Katie Tierney, Palolo Elementary's STEM Coach, was thrilled with the huge harvest of vermicast, her first. She will distribute it to teachers planting gardens and instruct them on the proper application.

Palolo's new STEM Coach **Katie Tierney** did such a masterful job working with the 2nd graders to feed and care for the worms, that when their vermicast harvest came due in November, a harvest party was scheduled and special people invited to witness an example of perfection – a huge colony of healthy, robust worms and a harvest of over 150 pounds of high-quality vermicast.

Palolo 2nd graders love to harvest vermicast just as much as Lanikai's 2nd graders, and in spite of torrential rains that morning, students got their hands dirty, rescued stray worms, picked out bits of plastic and other debris, interacted enthusiastically with earwigs, isopods, and Surinam roaches, and cleaned up all their equipment as well as could be expected.

Invited to this wiggly shindig was **Juliet Matsumura**, Sustainability Coordinator at Kaimuki Middle School, her husband **Kalani**, an extension agent for CTAHR, and **Kamal Kapadia**, a garden volunteer at SEEQS Public Charter School. All three of these environmental leaders visited Lanikai earlier in the month. It was suggested that they, along with Katie, form a mutually supportive Kaimuki Worm Hui, since they are all within a couple of miles of each other. It would be so helpful for sharing equipment, compiling bedding material, and figuring out how to feed and water worms through the summer.

All guests were duly impressed and had a wonderful time.



Kamal Kapadia has taken on the responsibility of the worm bin at SEEQS.



Juliet Matsumura from Kaimuki Middle School digs worms!

SEEQS Public Charter School

Following her eye-opening visit to Lanikai and a joyous morning at the Palolo harvest observing healthy bins, Kamal Kapadia requested a consultation at SEEQS.

SEEQS, ironically, stands for **School for Exploring Essential Questions of Sustainability**.

Unfortunately, the worm situation at SEEQS was not so rosy. Their worm bin was, in essence, a stinking, toxic, bubbly raw sewage heap. It was too disgustingly icky to poke through very thoroughly, but Ms. Mindy could not find a single worm in the smelly, goopy sludge.

Kamal had decided to have the students clean out the gunk and bury it in the so-called “compost pile” which was just a heap of mulch and garden waste, unwatered, uncovered, and obviously unmanaged.

SEEQS is in dire need of intervention. Kamal will inform the Administration of our recommendations and see if we can help.



Jordan and Kamal with the SEEQS worm bin, trying not to breathe through their noses. We would like the opportunity to give SEEQS some lessons in worm bin management, as teachers have requested and Kamal is doing her best to implement.



Master Gardener Training

Statewide Coordinator for the UH Master Gardener Program **Jayme Grzebik** scheduled a meeting to discuss the potential of partnering with Lanikai School to provide instruction on composting.

UH’s new Master Gardener program will be headquartered at the UH research station in Waimanalo.

In exchange for training, Master Gardener candidates will volunteer a number of hours for garden or other related projects, a requirement for their certification.

Both our apprentice schools – Ka’elepulu and Kainalu – could benefit from just an arrangement as well.

Community involvement grows wider and deeper!

Invertebrate Invitational

Much of the brainwork this month focused on preparing materials for the **Invertebrate Invitational**, the 3rd AINA session on hot composting presented on November 17th. This session was to introduce the organisms that populate and process materials in the compost pile after it cools down below 130 degrees, the period known as the mesophilic phase. A few weeks after the last feeding – when a total of 1,000 pounds of food waste has been added to the pile – the thermophilic (“heat-loving”) bacteria begin to decrease in numbers. Students enjoy testing the temperature of the pile during the thermophilic phase, watching the needle on the compost thermometer race up through 140, 150, 160 degrees and even as high as 174, the record! Although you cannot see the thermophilic bacteria, you definitely can feel and easily measure their presence. It’s clear when they start to decline – the temperature drops.

The cooler mesophilic phase features a community of very visible invertebrates, all arthropods, that take over the pile with a flurry of activity that even the most squeamish of students cannot resist. The compost critters have been hanging around the surface of the pile waiting their turn. These ancient,

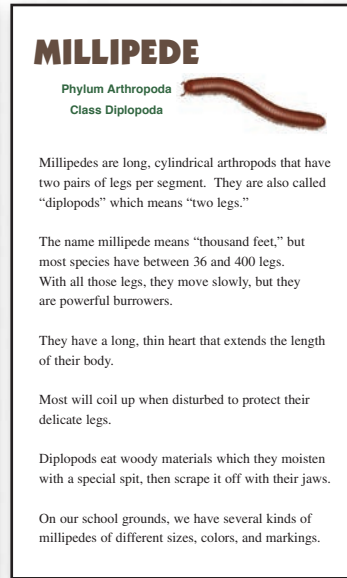
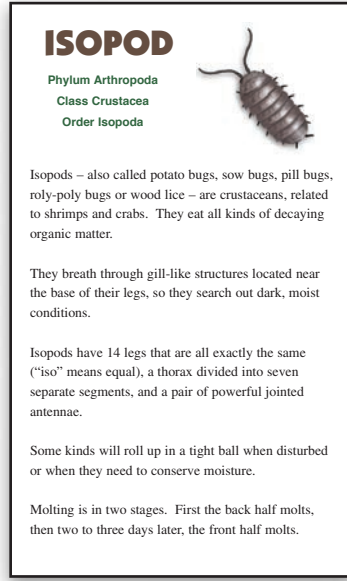
fascinating decomposers deserve careful study.

The standard presentation is to collect the various bugs in trays and just let the kids observe and handle them, but because we are exploring deeply every aspect of composting this year, a structured academic approach was deemed more appropriate.

Students would spend several minutes at each of five stations, listen to the docent read interesting information about each arthropod, then get some hands-on time before moving to the next station. This format can best be described as *speed-dating with bugs*.

An extensive web search revealed a total lack of decent published material for this grade level. The available images were either low-resolution photographs or cartoony, inaccurate drawings.

Why not create and produce our own upgraded invertebrate teaching materials?



Ms. Mindy wrote the text and **Steve Underwood of Underwood Graphics** was commissioned to do the illustrations.

Steve's the best! His richly detailed, scientifically accurate renderings of each arthropod are stunning.

Five informational 5-1/2" x 8-1/2" double-sided cards were produced, one for each station.

Each student received a 4-1/4" x 5-1/2" flashcard of the featured bug at each station. On the back, there is a line to print their name plus "What I learned about ISOPODS" (for example), with space to write a sentence or two in the last minute before rotating stations. Cards were handed in and later in the day the whole set was returned for the student to keep.

When we study worms in the next AINA sessions, four more invertebrate cards will be added – worms, snails, mites, and springtails – to round out the collection. With nine cards, teachers can play rounds of Invertebrate Tic-Tac-Toe to test student knowledge.


Since Lanikai School now owns the copyright to these excellent instructional materials, and there seems to be nothing of this quality on the market, why not package the set and sell them worldwide on the internet?

We will look into this. It could produce another revenue stream for Lanikai's garden program and fill a niche for good teaching tools.



SURINAM ROACH

Phylum Arthropoda
Class Insecta
Order Blattaria



All roaches, also called Blattarians, have a thorax concealed by a shield-like structure called a *pronotum*. The shiny pronotum is easy to spot.

They also all have very spiny legs which is why they tickle so much when they crawl in your shirt! These spiny legs are the reason that they are very fast burrowers and great climbers.

Because their eggs do not need to be fertilized by males, all Surinam roaches are females. Young ones are called nymphs. The ones with wings are the adults.


This species can be found only in warm, tropical climates. Unlike the big roaches we squish in our homes, Surinam roaches do not like to live indoors.

They eat decaying organic matter in our compost piles, and help aerate the material as they burrow around.



EARWIG

Phylum Arthropoda
Class Insecta
Order Hemiptera



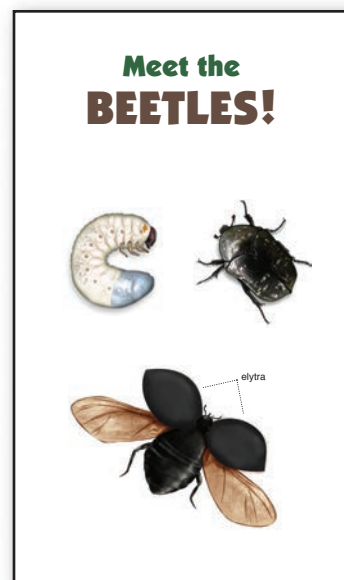
Kids call these beautiful insects "pincher bugs" but they generally do not use their pinchers – called **cerci** – except to scare off enemies. (Did it work on you?)

There is an old myth that earwigs climb into your ears at night and lay eggs in your brains but this is absolutely not true – dermapterans are completely harmless.

Their name means "skin wing" and refers to the leathery texture of their short forewings. Underneath the forewings is a big, folded-up fan-like wing but earwigs rarely fly.


Like all insects, they have a head, thorax, abdomen and six legs. They have beaded antennae and mouthparts for biting and chewing.

In our compost piles, they feed on all kinds of decaying organic matter.



BEETLES

Phylum Arthropoda,
Class Insecta
Order Coleoptera



Coleoptera are the largest group of insects in the world, with over 360,000 species!

Coleoptera means "sheathed wing." The grubs we find eating decaying organic matter in our mulch and compost are the larval stage of the big Oriental Flower Beetle we see a lot this time of year. Check out these big fat beetle grubs! They are decomposers working in our compost piles, but the adults are garden pests.

Unlike the other arthropods we are studying today, all beetles experience **complete metamorphosis** – they change form throughout the stages of their lives, from egg to grub to pupa, to winged adult.

What all adults have in common is two pairs of wings. The front wings are modified to form a shell-like cover to protect two thin wings hidden beneath. This protective cover is called the **elytra**. The lady bug, for example, has a polka-dot elytra.

