# Sierra Heights

## **Vermicomposter Project**

Sierra Heights Elementary Renton, Washington June of 2009

## An effort to reduce biomass entering Washington's landfill system.



The <u>Project Summary</u>, Lesson Plans, Notes, and Reflections are designed to serve as a guide for others that make the decision to start a Vermicomposting project and thus reduce the amount of food waste leaving their school and entering the landfill system.

## Sierra Heights Vermicomposter Project Sierra Heights Elementary Renton, Washington

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**A report by:** Sierra Heights Elementary Renton, Washington

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#### Project Summary

In 2007 Brian Teppner, a fifth grade teacher at Sierra Heights Elementary in Renton, WA, developed a plan to make the school more environmentally friendly. The project began with a connection to the King County



"Green School" project. As part of the process of becoming a "green" school, staff and administration needed to select areas of emphasis. The most significant area of interest for the school was an interest in the reduction of food waste. This led Brian to a Washington Department of Ecology grant focused on the reduction of biomass entering the landfills. This grant would fund the development of a Vermicomposting Bin and enough worms to effectively reduce the amount of food scraps leaving the building. Applying for this grant involved an extensive district procedure involving the approval of both the physical property and the supplement to the Renton School District Curriculum.

#### **Building/District Support**

- Curricula
- Student Time
- Adult Commitment
- Physical Property

#### Education

- Lesson Plans for Students
- Teachers
- Administration
- Community

#### Worm Bin

- Selection
- Purchase/Build
- Installation
- Maintenance

#### Worms

- Purchasing
- Introduction
- Maintenance
- Special Care

#### **Feeding The Worms**

- Lunchroom Changes
- Monitoring
- Community Support

#### Harvesting

- Worm Casings
- Plans for the future

#### Communication

- News Releases
- Impact on the Community

#### **Building/District Support**

Starting a Vermicomposting project requires a great deal of support, commitment, and approval. This is not intended to discourage involvement but to create awareness to the many impacts of such a valuable endeavor. Some of the considerations include...

The time commitment of the students and adults centered on the physical task of caring for the worms and changing school procedures can be extensive. Students and adults are likely going to be involved in the lunchroom collection of food waste as well as the care of the worms themselves. This involvement requires a commitment of staff and students. Time is valuable and when student learning time is potentially involved it would be advisable to seek staff advocacy early on in the project. The time commitment for students is centered around setting up a couple of tables each day at lunch but if your school has multiple lunches this will ether require additional students to cover the various shifts or it will

require a rotating schedule so that students aren't missing out on their daily instruction. Additional student time will be needed at the project's inception as they are trained and become the trainers. (see lesson plans for preparation for the All School Assembly) Staff will be needed to supervise these students for behavior and for expediency. This is either going to involve teachers, classified lunchroom staff or the custodial personnel. These people are going to be crucial to the success of the program. They need to be valued and their input needs to be valued as they will be the on the front line of the Vermicomposting program on a daily basis.



There are also considerations involving the physical property itself. Beyond making the choices of the scale of the project to determine the size of the Vermicomposter needed to meet the needs of the population, there is the placement issue to deal with. Whether the Vermicomposter is a small tub in a classroom or an industrial sized vessel placement is likely going to be an issue. Though Vermicomposting, when done right, are low in odor, there are inherent concerns about attracting rodents, insect pests like wasps and flies, as well as the potential for vandalism. It is likely that permission is required from a building and district administrator for the project to move forward. There are also curricula considerations. When students become involved in a project they are likely going to require instruction on the care of the worms and impacts on the environment. It will be important that this instruction is aligned with district curricula or that approval is attained to supplement the existing district goals or curriculum. Other people that may need to be contacted include your custodial engineer, district maintenance staff, as well as people from the facilities and operations department. You will likely be answering questions about the care of the composter, the chain of command involved around care for the physical property, ownership of the container itself (It will likely need to be gifted, donated, or purchased by the district to be on school grounds.) These people may want to know what happens if the people involved in the project move away from the school site, so a plan that requires team organization will likely need to be in place.

#### Our Experience...

In our experience at Sierra Heights Elementary, administrative support took time. Make sure to get all of your ducks in a row before beginning such a venture. Because of the Vermicomposting Department of Ecology grant the Renton School District now has clarified its process for procuring grants.

#### Education

Due to the nature of the project and in alignment with the goals of the grant, students and community support were crucial to the project success. In every possible way, the project has given critical roles to the student population at Sierra Heights Elementary. This involvement required knowledgeable students which led to classroom instruction.

Entire units can be found online to have students explore the worm's ability to consume vegetation in the decomposition process. One that several teachers in our building referenced was this link.

#### http://commtechlab.msu.edu/sites/letsnet/Frames/Subjects/science/b2u1l1.html

**Before training your students, you must educate your school staff.** You are going to need advocates to support you on your Vermicomposting project and that support begins with a knowledgeable staff. Bring in whatever agencies or resources you have available to you to train your staff on the basics of worms and their potential impact on reducing the amount of waste entering the landfill. Then train them on the procedural

changes to the lunchroom routine. Ask for support and patience. The King County Green School program was very supportive in this process and got the Sierra Heights Elementary staff motivated to stand behind the changes.

**Creating a Green Team...** There are many components to a project like this, including the staff, administration, and student population that take on specific tasks needed to support the worms. The staff may need additional training from resources or be willing to commit to additional responsibilities that they may or may not get financially reimbursed for. The administration needs to be flexible enough to handle



change as lessons are learned along the way. Teachers are also going to be responsible for selecting responsible students to participate in the collection of food and training of students. These students may be required to miss selected class sessions in order to complete tasks related to the, handle garbage from other student plates, or complete duties involving the cleaning, weighing or dumping of waste and thus may need to have permission from parents to participate. These students at Sierra Heights also met monthly at a lunch time to talk about concerns, share ideas to improve the program, and celebrate our successes.

**Community education cannot be missed.** There is no greater ally than the school parent. An active PTA can make or break a project like this. Parents can be involved at many levels including: lunchroom cleaning, management of student behavior, sorting of waste materials, or dumping of waste to the worms or appropriate bins or tubs. Education of the PTA or parent group may require attendance of evening meetings to rally for support, writing of a short story to explain the project in a monthly newsletter, or communication via kid mail or curriculum nights. These lunchroom procedures should also be used when having parent involvement nights that have food provided to model what students do each day. In our case, this support included a joint funding option to pay for supplies such as gloves for students to wear, miscellaneous supplies, as well as t-shirts to identify student volunteers. Parents in the local community even took the challenge home with them. See the article in the communication section detailing members of our local PTSA that got involved in a food waste challenge between neighbors.

### Lesson One (Training the Trainers – Preparing for the Introductory Assembly)

#### **Content Objectives**

The students will develop an understanding of the effects different organisms, including humans and Red Wiggler worms, have on one another.

#### **Materials and Resources**

- Computers with Internet Access, Word Processing software, and presentation software with a program like Microsoft PowerPoint.
- 2. Worksheet or questions posted for the students to research...

#### **Lesson Procedures**

- 1. Open with brainstorming session about general meanings of the terms reduce, reuse, and recycle.
- 2. Focus the lesson on reducing waste through a visit to the lunchroom or the lunchroom dumpster and then introduce a handful of worms. Allow for some oohs and awes from students before asking what the role of worm is in. (The expectation is that students have had some exposure to the terms and meanings of producer, consumer, and

WORM NEEDS???? Name******
How much do worms eat?
What kinds of worms are used in worm bins?
What is Vermicomposting
What organisms live in the soil with the worms?
How do worms eat?
What kinds of foods do worms eat?

decomposer. If students lack this experience, additional exposure will be needed.)

- 3. Allow for discussion and then pose the question "How could worms help us reduce the amount of waste that we have in the lunchroom?"
- 4. Once students have the opportunity to come to the idea themselves, ask them what they would need to know about worms in order to start a Vermicomposter/Worm Bin program at the school.
- 5. Break students into groups with the questions shown above given to the different groups. Explain to the groups that they can use the computers for research but that at the end of the project they all needed to be the worm experts with an end product that could be used in an all school assembly to introduce the new program. (An additional group worked on the lunchroom procedural changes along with me and the King County Green School support staff.)
- 6. Students developed and agreed to the following rubric to guide their efforts. (see below.)

Facts are presented that answer the questions that the group was responsible for.					
5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT	
Important facts were shared	Important facts were	Many facts were shared	3-5 facts were shared	1-2 facts were shared	
multiple times and people	shared multiple times		but some of the facts		
were given the chance to ask			were "off topic"		
questions					
Creativity was shown in the presentation with consideration for multiple intelligences.					
5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT	
Interactive presentation	The presentation	Presenters did some	Presenters talked and	Talking only. No	
included music, art,	included music, visual	talking, visual aids were	used a visual aid in the	visual aids or other	
movement and was	aids, and the audience	used and audience had a	presentation.	"intelligences" were	
interactive with audience.	participated in the event.	chance to participate.		addressed.	
Preparation for the presentation was of a high quality.					
5 POINTS		3 POINTS		1 POINT	
Students created quality		Students prepared their		Students were not	
product without the support		presentation with some		prepared & others	
of the teacher.		support from a teacher.		had to share this	
				information.	
Entertainment value of the presentation.					
5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT	
The audience interacted with	The audience paid	The audience paid	The audience was	The audience seemed	
the presentation, paid	attention and showed	attention and applauded	interested at some point	bored and uninvolved	
attention and seemed	enthusiasm for the	at the end of the	but lost interest at other	in the presentation.	
enthusiastic.	presentation.	presentation.	times.		

The Sierra Heights All School Assembly to kick off the Vermicomposter project was spectacular. The students really ran the show. We spent almost an hour in a cafeteria with over 600 students that were highly engaged and enthusiastic about the project. The only way that I could have seen to have improved upon the assembly would have been an interactive worm activity but our worms were still on order at the time of the event. Our activities included:

#### 1. Presentation by King County Green Schools

Representatives from King County Solid Waste came to share some data about the impact of school food waste on the landfills and information about how the Green Schools program can help. This presentation also included individual tasks that can benefit the environment and ways to help at home.





#### 2. Reduce, Reuse, & Recycle

One group of students shared an interactive activity with the students. They taught the school three arm gestures to represent Reduce, Reuse, and Recycle, modeled their use while singing a simple song, then quizzed the group about different types of activities (which category they fit

#### 3. Red Wigglers 101

Another group of students explored the life, anatomy, and needs of the composting worms. This PowerPoint included pictures, music, animations as well as an interactive quiz at the end. Students were randomly selected from the audience to respond to summary questions about worms. This group was responsible for getting the student population to perceive the worms as pets rather than some "icky" decomposers.

into...).





4. What Worms Can and Can't Eat Challenge Game

This student group first outlined the foods that could and couldn't be eaten by worms, had students from the audience review what had been learned, and finally had the principal from the school participate in a game-show style challenge with pictures of food to place either in the worm tub or a garbage can. The students were sent home with a reminder of what foods could and couldn't be fed to worms.

#### 5. Lunchroom Practice

The final group shared the procedural changes for the lunchroom routine. These student leaders modeled the dismissal, worm feeding, liquid dump station, recycling, and garbage placement. These students also displayed a map that outlined the locations of all signage and waste containers. Student volunteers from various grade levels were brought up to the stage to practice the new routine and the group wrapped up the assembly with a second singing of "Reduce, Reuse, Recycle".



#### Worm Bin

There are hundreds of different sizes, shapes, models and designs for a worm bin. Your conditions, the budget you are working with, the scope of the waste you are trying to remove from the landfill system and the time commitment that you are willing to commit to the project are all factors in determining the type of worm bin to use for your project.



#### Selection should be based on the following criteria...

#### • Needs Analysis

Before you can calculate the number of worms needed and the size of the Vermicompost bin required, a school needs to analyze the current waste habits through a "waste audit", like the one shown to the right from King County's Green School Program. This form can be found on their website along



with a ton of other resources. http://your.kingcounty.gov/solidwaste/greenschools/documents.asp

#### • Purchase/Build

The Internet is a stockpile of information on building and purchasing worm bins. The one we purchased can be seen above. This one is designed to handle large quantities of food scraps on a daily basis. Things to consider when making this decision go beyond size. One needs to figure out the mobility of such a container. Will it need to be moved in future years? Are there electrical or water needs for the worm bin to function properly. Also, remember that many of the plans for worm bins are designed for use in regions with different climates than we have here in the Pacific Northwest.

#### Installation

Your worm bin will likely require some level of installation or construction. This will require both labor and supply of tools. In our case, a special forklift was needed to move the bin to its resting place. This forklift was not included in the delivery of the bin and needs to be part of your considerations if selecting a large container. Remember that introduction of the bedding and worms may not be included in any such purchase.

#### • Maintenance & Harvesting

The worm bins come in many different qualities. An industrial material may cost more but may be easier to maintain in the long haul. Maintenance requires some sort of turning of the waste and removal of castings in the least. Our container has a crank on the side to allow castings to drop down from the top "worm" area. I will add that at the time of this report castings have not yet been harvested but are awaiting the fall arrival of labor to aid in this endeavor. These castings will be used to supplement the soil in the beds around the school grounds. After completing this task, materials have already been purchased to construct a garden area which can then be used for students to experiment with growing plants to share with local food banks as part of a stewardship effort.

#### Worms

Obviously critical components to a Vermicomposting project are the worms themselves. The worms are really the stars of the show, but they require some special care and maintenance to keep them healthy.

Purchasing the worms for a Vermicomposting project can be a surprising task. The "red wiggler" worms eat



their weight in food waste every other day. These can be purchased at any one of a variety of local vendors or even through the internet. Do your research. One thing that may take you by surprise is the expense of the worms. A pound of worms may cost between 20 and 40 dollars per pound depending on the area you are living and availability of these hungry worms. One pound of worms will be approximately 1000 worms and can eat about a half of a pound of food scraps per day. This means that if your facility wants to move 25 pounds of food waste per day out of the landfill via Vermicomposting you will need to have 50 pounds of worms (50,000 worms hard at work) at an approximate cost of \$1500 just for the worms.

Mark Yelken, The Worm Guy", was instrumental in assisting us in setting up our program in Western Washington. He can be reached via his website and is housed out of Vashon Island, WA. <a href="http://www.thewormguy.org/index.php?module=pagemaster&PAGE">http://www.thewormguy.org/index.php?module=pagemaster&PAGE</a> user op=view page&PAGE id=1&MM <a href="http://www.thewormguy.org/index.php?module=pagemaster&PAGE">N position=17:17</a>

A worm bin can be constructed at any time of year but there are a variety of factors to consider. Time, temperature, availability of resources, and the amount of food waste that will be added to the bin are all factors to consider before starting out on this venture. Depending on your climate heat is probably the most critical factor to consider when planning out your worm bin. Both cold and hot extreme weather conditions can create a deadly environment for the worms. Because of this it is likely that fall and spring would be the

most ideal seasons to begin raising worms. Since you are in a school that has a dramatic decrease in food scraps over the summer it would be my suggestion to start your worm bin in the fall. There are some additional benefits to starting in the fall. When you first introduce worms to a worm bin they will require moist bedding material as a foundation to their habitat. You can purchase a wide variety of products from any number of vendors... or you can go out to the lawn area under a large tree and collect all of the free bedding material that you will need in the form of falling leaves. This also creates an additional stewardship effort for students as they use debris that they cleaned up around their school to improve the living conditions in



their worm habitat. In our case, we save leaves from the previous year to start in the spring. However, this was not well received by the custodial staff at my building and would not be my recommendation. If you chose to do this, you will also have to add additional liquid to your bedding because of how dried out the material will be whereas the fall leaves have a great deal of water in the foliage. It is recommended that you also add some additional decaying organic material at the construction of your worm bin. Horse manure is perfect for this, though it has more aroma than other vegetation. **See King County's "Green School" Website for more information on how to care for your worm bin over the summer.** 

http://your.kingcounty.gov/solidwaste/greenschools/documents/care for your worm bin.pdf

Who says that worms are not high maintenance? Your worms will eat all vegetables, fruit, plant materials, breads, or paper that is placed in the worm bin. However, the denser the product, the longer worms and bacteria will take to break the material down. Thus a lettuce leaf will be gone long before a tree branch. There are some exceptions. Don't add citrus to your worm bin as it can be lethal to your worms. We have had some citrus enter our bin and it was consumed by the worms, but I wouldn't make a habit of adding oranges to your bin to be safe...especially with the cost of the worms. The worms also require a moderate temperature and



moist conditions. During times of extreme temperatures it may be necessary to provide special care. The bin needs to be placed in a protected area, out of the direct sunshine. Ours was placed in a protected corner of a lawn area and it seems to have offered protection from the heat more than the cold. We had a nearly catastrophic die-off over our first winter after a huge cold front dropped 18 inches of snow and left temperatures in the teens for almost two weeks. We have heard of local Vermicomposters adding heating blankets or heat coils to the surface of their outdoor worm bins to protect them in the extreme cold of the winter. Rain is also a variable to consider. Even though our bin is

covered with 2 lids, rain still gets in. A little rain is great; a lot can be devastating to your worm population. In extreme wet conditions the worms will attempt to exit the worm bin in search of drier ground. Your bin also loses vital nutrients as the water runs through the worm castings in the bin. The side benefit to this run-off is very green lawns around the Vermicomposter. To combat these harsh conditions the Sierra Heights Elementary Vermicomposter is constructing an "A-frame" awning to protect the bin from the elements.

#### **Feeding the Worms**

The process of collecting lunchroom waste for the worms will have an impact on lunchroom procedures. Students will need space to collect the waste and procedurally there will be changes in the waste collection process. Instead of dumping everything in a trash can as they are dismissed by a staff member, time will now need to be allotted for students to separate trash for your new worm needs. Because the overall goal for our program was the reduction of waste into the landfill system, separating items also included changes in recycling habits. Milk cartons, bottles, cans, and empty recyclable containers were separated which required a liquid dump bucket. Because of the smell of the milk containers, we experimented with rinsing them prior to dumping but settled on a double bagging procedure which satisfied the custodian and the local waste management company picking up our recycling. Beyond their initial training, students also developed a daily bulletin to post on a cafeteria whiteboard detailing what items from the school hot lunch could be fed to the worms. Announcements were also made at each lunch by the green team students alerting the rest of the student population to concerns and new knowledge about reducing, reusing, recycling, or the worms' health.



#### **Monitoring & Community Support**

The worm bins are now pretty self-sustaining but do require summer care from staff or community volunteers. Our PTSA membership frequently comes up to the school over the summer to feed the worms or add needed water to the bin during times of extreme heat. Heat readings are an excellent indication of success as if the bin is too cool activity will slow and if the worm bin gets too hot you end up with cooked worms. The support of the local community is an integral part of any such endeavor. I recommend asking for the support of local vendors including vegetable markets, grocery stores, or restaurants to supply foods



in the summer time. In doing so you are meeting the needs of the worms, sharing a positive message about the stewardship of the students towards the local environment, and reducing the food waste of these businesses. These partnerships can only add to the benefits of such a program.

#### **Growth of the Project**

One school cannot make a dent in the amount of waste entering the landfill, but as this report shows, the project can make an impact on a community. As a result of this project a local charity donated money for the fourth graders of Sierra Heights to go on a field trip across a ferry to Vashon Island where Camp Sealth has a successful Vermicompost program in the works. Brian Teppner has now moved on to a district science position. As a teacher on special assignment, he is now in a position to bring the project to other schools or in the least, share the model with interested parties around the area. In the current economic times, the district is unable to support the purchase of supplies and time needed for a district-wide implementation but support is building with administrators and the success of the Sierra Heights project will be crucial to the growth at a building level. However, it is clear that other Renton schools have Vermicomposting programs now in effect at the classroom level and Brian has collaborated with these individuals to support their endeavors.



#### Communication

Once we began the venture it didn't take long before interested community members were proudly recommending news organizations do stories about the program. Various news publications picked up on the Vermicomposting project.

Students at Sierra Heights brought home their new knowledge and inspired their parents to begin to reduce the amount of biomass that they send to the landfill. http://seattletimes.nwsource.com/html/localnews/2004447138 trashdiet30m.html

The King County Class Act news cited Sierra Height's accomplishments. http://your.kingcounty.gov/solidwaste/education/documents/ClassAct 2008-winter.pdf

The Seattle Times also did a pictorial with the following commentary.

#### Elementary to work with green program

Sierra Heights Elementary in the Renton School District hopes to reduce by half the amount of trash produced at lunchtime under a new partnership with King County and the state Department of Ecology. Beginning this winter, the school will work with King County's Green Schools Program to reduce food waste and encourage recycling and composting. Students will be responsible for separating, weighing and placing food into worm bins. The Green Schools Program, launched in 2003, helps schools find ways to reduce garbage production and energy use. Sierra Heights has applied for a \$10,000 grant from the state Department of Ecology to pay for the project, district officials say. - Karen Johnson

The news article on the right was printed in the Renton Magazine and can be found at the following website.

http://your.kingcounty.gov/solidw aste/greenschools/documents/Ren ton Magazine Sierra-Heights.pdf

### Sierra Heights school lunch leftovers fed to the worms, for the environment

#### BY ANDREW FICKES

ierra Heights Elementary School students are feeding their lunch leftovers to the worms, but it's not a commentary on the quality of the food. It's part of a pilot project aimed at reducing landfill waste and raising awareness of environmental issues

The project is the brainchild of Brian Teppner, who teaches a fourth and fifth grade combination class at Sierra Heights. The idea is for the students to help their school reduce the amount of waste exported from the cafeteria to the landfill.

Teppner, a National Board Certified teacher, was once a professional landscaper and said the idea for the classroom project came to him when he first started teaching at Sierra Heights eight years ago.

"It's been something I've wanted to be involved in for some time, but just hadn't found time to do it," he says. "One of my daughters is in my class this year, though, so it just felt right to take it on. I wanted to be a role model as a dad and as a teacher.

To get the ball rolling, Teppner sume a half a pound of food. approached King County Solid Waste's assistance

and water conservation.

"Our focus is on the reduction of Teppner of his school's efforts.

the PTSA. The Green School's program measure what is collected. will provide up to 80 percent of the recyand cannot be recycled.

lot. In the vermacomposter, worms will That's important to me." eat away the food waste and provide compost for the school's soil. The worm grant will expire and he'll report to the

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RENTON MAGAZINE / Andres Ficke Teacher Brian Teppner and students Jeremy Thiessen, left, and Derrick

#### Our focus is on the reduction of biomass going into the landfill.

worms, which is 2,000 worms, to con- be applicable for other schools.

Demers sift through food items for the worms

Green Schools program last spring for 50 percent of the school's garbage at where," he says. Sierra Heights," said Green School's The Green Schools program, which director Dale Alekel. "Students will be use the compost from the worms to fertilstarted as a resource to schools in the diverting the food waste from the lunch- ize a school garden where vegetables and greater Seattle area in 2004, helps room garbage into the vermacomposter, schools with waste reduction and energy reducing food waste. It's a wonderful educational tool."

At each of the five lunch periods, biomass going into the landfill," says Teppner says, four students will guide their peers in a uniform process of emp-To finance Sierra Height's pilot pro- tying liquids, recycling, emptying approgram, Teppner qualified for an \$8,000 priate food waste for the worms, and grant from the state Department of dumping the rest in the garbage. There Ecology. He also received funding from will be a container for each. Students will

"Students will slowly learn what is cling containers and also recycling labels good to bring to lunch, based on what is informing students and staff what can recyclable or edible for the worms," Teppner says. "We'll learn which hot In January, Sierra Heights installed a lunches incur a lot of waste and cut back vermacomposter behind the staff parking on those. It will be totally student-run.

By spring of 2009, Teppner says his

supply will grow to as many as 50,000 Department of Ecology on what the worms. Teppner says it takes a pound of school learned and if the program would

"Part of the end product is educating "Food waste composes about 30 to others and replicating the process else-

An ultimate goal for Teppner is to herbs would be grown. He imagines a 10foot by 15-foot garden to start.

"I'd like our students to grow crops and give to the local food bank," he says. Nanci Davis, Sierra Heights' princi-

pal, is a great supporter of the program, believing wholeheartedly in the value to the students.

"We need to conserve and recycle and it's for the benefit of all, not just for our school," she says. "We just hope that children become aware and pass it on to their parents. And eventually we would like to see it done throughout the district."

Editor's Note: Do to a technical error in the January issue, parts of this article were garbled. We are reprinting it in its entirety and apologize for the inconvenience.