Conservation
Fall 2011

Name: ________________________

Lifestyle Project Part IB:
Baseline Data Analysis
(Modified from Kirk and Thomas, 2003)

Due: in lecture Friday, September 23rd

⇒⇒***Attach your Baseline data*** ⇐⇐

Now that you have recorded your activities for two days, you can translate your actions into figures. Use the data, equations and examples below to quantify some of your environmental impacts. You may need to use additional paper. You will be converting your energy usage into British Thermal Units (BTUs).

1. ENERGY CONSUMPTION

1A. PERSONAL TRANSPORTATION: These equations allow you to convert the miles you drove into BTUs.

$$\frac{\text{total miles driven}}{\text{gas mileage of your car (miles/gallon)*}} = \text{gallons of gas used}$$

gallons of gas x 125,000 BTUs/gallon = total BTUs

*If you do not know the gas mileage of your car, you can go to http://mpgfacts.com/ to find, the make, year and model. Make sure to use the **Combined MPG** column.

Example:

$$\frac{\text{23 miles}}{\text{28 miles/gallon}} = 0.8 \text{ gallons}$$

0.8 gal x 125,000 BTUs/gal = 102,678 BTU's

Enter your calculations below:

$$\frac{\text{\_\_\_\_\_\_\_\_ total miles driven}}{\text{\_\_\_\_\_\_\_\_ miles/gallon}} = \text{\_\_\_\_\_\_\_\_ } \textbf{gallons of gas used}$$

TOTAL ________ gallons of gas x 125,000 BTUs/gallon = _______ **BTUs**

1B. INDUSTRIAL ENERGY CONSUMPTION:

This is not something that can be easily quantified; so for now just make sure that you have a thorough record of the list of products that you purchased during your two baseline days.

1C. RESIDENTIAL ENERGY USE – This section includes the energy used to produce hot water, the use of electricity for appliances, and natural gas for stoves.

<u>Hot Water</u> – This calculation requires two steps: (1) Multiply each water usage by the appropriate flow rate (in gallons/minute) to determine the total gallons of water heated. (2) Determine how much energy it took to heat the water. PLU heats the water to approximately 140 degrees F, and the water enters the system at 55 degrees. To raise the temperature of one gallon of water by 85 degrees requires 440 BTU. Thus, to determine your total energy usage for hot water, multiply by 440.

<u>Example</u>: I took a ten minute shower in a standard flow shower:

Step (1): 10 min. x 5 gal/min. = 50 gal

Step (2): 50 gal x 440 BTU/gal = 22,000 BTU

<u>Enter your calculations below (make sure you pick the correct set of flow rates)</u>:

For low flow showers and sinks (all residence halls at PLU):

Step (1)

hot shower __________ minutes x 2 gallons/minute = ______________ gallons

sink __________ minutes x 1.5 gallons/minute = _______________gallons

laundry (hot) __________ loads x 25 gallons/load = _______________gallons

laundry (warm) __________ loads x 10 gallons/load = _______________gallons

dishwasher __________ loads x 12 gallons/load = _______________gallons

other ______________________ gallons other ______________________ gallons

Step (2)

TOTAL ___________________ Gallons x 440 BTU/gal = _______________________ BTU

For standard flow showers and sinks:

Step (1)

hot shower __________ minutes x 5 gallons/minute = ______________ gallons

sink __________ minutes x 3 gallons/minute = _______________gallons

laundry (hot) __________ loads x 25 gallons/load = _______________gallons

laundry (warm) __________ loads x 10 gallons/load = _______________gallons

dishwasher __________ loads x 12 gallons/load = _______________gallons

other ______________________ gallons other ______________________ gallons

Step (2)

TOTAL ___________________ Gallons x 440 BTU/gal = _______________________ BTU

Electricity – Find the **total number of BTUs** you used in direct electrical usage. This calculation has **four steps:** (1) For each of the appliances you used, multiply the number of hours used by the number of watts (*see note on wattage below*), (2) Divide that number by 1000 to get kilowatt-hours (KWH), (3) Each kilowatt-hour is equivalent to 3412 BTU, so multiply KWH by 3412 to find BTUs, and (4) calculate the total amount of BTUs you used for electricity by summing the results from step (3).

For Steps (1), (2) & (3) Record all your calculations on a separate sheet of paper (and attach it).

Example: I watched TV for 1.5 hours

1.5 H x 300 W = 450 W

$$\frac{450\text{ W}}{1000} = 0.45\text{ KWH}$$

0.45 KWH x 3412 BTU/KWH = 1535 BTU

Note on Wattage: You were asked to record the wattage (or amperage) of your appliances on the Baseline Data Collection assignment. Many common wattages are indicated in **TABLE 1** (on the next page) or at the websites provided on Sakai. If you want to find out what the wattage (W) is for something that is not given on TABLE 1 (indicated by a blank instead of a number) then look on the back or bottom of the item, and it usually is written there. If it does not indicate the wattage, then look for the amperage (A). The number of amps multiplied by 120 (volts) is equal to the wattage.

Example: this computer uses 1 amp x 120 volts = 120 watts

Step (4) Based on the calculations that you have made for all of the appliances (on your separate piece of paper), determine the **total number of BTUs** you used in direct electrical usage:

TOTAL ________ BTUs **for electricity**

If you have a gas stove you must **also** calculate the energy usage**:**

Gas stoves: a standard gas burner uses 9,000 BTUs/hr

TOTAL ________ BTUs **for gas stove**

Table 1: Appliances – How Much Wattage?

	Wattage		Wattage
Refrigerator (large)	750	Microwave	1,450
Refrigerator (medium RH size)	330	Stove (electric)	12,000
Refrigerator (small RH size)	300	Oven	12,000
Washing machine	375	Clock	4
Dryer (electric)	5,000	Iron	1,000
Incandescent lights (wattage on bulb)	______	Hair dryer	1,600
Fluorescent lights	18	Electric razor	______
Radio (clock or other)	20	Fan	______
Portable CD/tape player (box)	24	Humidifier	______
Stereo (full size)	80	Blender	______
TV *	300	Computer	120-240
VCR *	19	Inkjet printer	5 watts off 30 watts printing
Answering machine	______	Cell phone charger	50
Dishwasher	1,200	Other ____________	______
Coffee maker	750	Other ____________	______

* Some televisions draw significant amounts of power when they are not being played. For example, a plasma screen that is on standby may use 80 to 90 % of the energy that is required to project an image.

2. <u>FOOD</u>: It's hard to quantify how much energy and resources go into what we eat, so we're just going to make some general observations. Generally, the less processed a food is, the less energy goes into making it; so fruits and vegetables require the lowest energy input (and waste output) per calorie. A highly processed food (twinkies, for example) requires more energy input and waste output per calorie compared to a more simple food like an apple. The category of food with the highest environmental toll in terms of energy and water input and waste output is meat. For example, it takes 2,500 gallons of water to produce one pound of meat. This is because energy and water must first go into the production of grain crops, which are then fed to the livestock. Most animals are about 10 percent efficient at converting the energy from eating plants into muscle. The other 90 percent is used in the daily activities of the animal or is dissipated as heat. So this means that it takes approximately ten times the resources to produce meat as it does to produce vegetables.

With your food intake, **on a separate piece of paper break down all the foods you ate into three categories**: <u>unprocessed</u> (fruits, vegetables, whole grains), <u>minimally processed</u> (pasta, bread), and <u>highly processed</u> (twinkies, cheese doodles, meats). Refer to **Table 2** (on next page) for examples of foods that fit into the various categories.

Table 2: FOODS: How much processing?

Examples of foods by amount of processing.

Unprocessed **Minimal packaging**	**Minimally processed**	**Highly processed** **Lots of packaging**
Fruits	Whole grain pasta	White bread
Vegetables	Whole grain bread	White pasta
	Bulk oatmeal and other ground grains (includes white rice)	Twinkies
Whole grains (includes brown rice)		Cheese doodles
		Candy
Dry beans (kidney, pinto, etc)		Cookies
	Conventionally produced eggs	
Cage-free eggs (all PLU purchased eggs)		Pre-packaged meals
	Canned beans (kidney, etc)	Cold cereal
Honey	Peanut butter	
	Applesauce	Sugar
	Fruit juice (not fruit flavored drinks or punch)	Jam/Jelly
		Flavored latte in paper cups
	Coffee	Conventionally produced dairy products
	Tea	
		Ice cream
	Organic dairy products – milk, cheese, yogurt	Sweetened soy milk
	Soy milk (unless heavily sweetened) and tofu	Sodas
		Flavored water
		Sports drinks
	Mayonnaise, ketchup, mustard (unless heavily packaged)	Energy drinks
		Meat
		Fish sticks
	Unflavored latte in your own cup	Garden burger
		Soup – canned, carton, cup-a-soup, etc.
	Fish	

NOTE: We are looking at a combination of packaging, processing (use of resources such as energy and water), and waste generation for our ranking. Thus, a ready-to-microwave potato that comes in plastic wrap is highly processed, whereas a potato purchased in bulk in the produce section of the grocery store is unprocessed.

3. <u>WATER</u>: Use **one** of the water forms below:

Use the flow rates given below to find your total water usage:

For low-flow plumbing (all residence halls at PLU):

shower ___________minutes x 2 gal/min. = ________________ gallons

bath _____________ minutes the tap runs x 5 gal/min. = ________________ gallons

sink _________ minutes x 1.5 gal/min. = ________________ gallons

toilet flushes ___________ x 3 gallons each flush = ________________ gallons

dishwasher loads___________ x 12 gallons/load = ________________ gallons

washing machine loads _________ x 20 gallons/load = ________________ gallons

other __________ gallons

TOTAL _______________ gallons

For standard plumbing:

shower ___________minutes x 5 gal/min. = ________________ gallons

bath _____________ minutes the tap runs x 5 gal/min. = ________________ gallons

sink _________ minutes x 2 gal/min. = ________________ gallons

toilet flushes ___________ x 3.5 gallons each flush = ________________ gallons

dishwasher loads___________ x 12 gallons/load = ________________ gallons

washing machine loads _________ x 20 gallons/load = ________________ gallons

other __________ gallons

TOTAL _______________ gallons

4. <u>WASTE</u>:

This is something we won't quantify other than to list the items individually. If you really wanted to quantify it, you could weigh the amount of stuff you throw out, but it's probably easier to just write it all down. So just make sure that you recorded the list of the **garbage**, **recycling**, and **compost** that you generated over the two-day period. We will examine different waste management techniques more closely later this semester.