Lab 1 Survey

Page 1

Consent

The purpose of this lab is to characterize the water use ("water footprint") of Rose-Hulman students and their knowledge about "virtual water" (water requirements in manufacturing). This survey will form the data you analyze during the lab.

You are required to complete the lab as part of the course; however, **your decision to complete any question on this survey is entirely voluntary and will not impact your grade in the course**. All responses will be kept confidential, and you will not be asked to identify yourself. Neither the instructor nor other students in the class will be able to link you to the responses provided (all data is de-identified).

We anticipate the survey will take 10-15 minutes to complete. There are no known risks associated with participating in the survey. However, you may feel the time required to complete the survey is best spent elsewhere; it may also be that contemplating your water use causes you some anxiety about your lifestyle; for these reasons, you may not want to participate. You may choose to participate because completing the survey will give you a better understanding of the variables used during the completion of the lab. You will also be benefitting your fellow classmates by contributing to data that will enable us to complete the class lab as planned.

If you choose not to participate in the survey, you should submit the survey without answering any of the questions. You may change your mind and decide not to participate at any point during the survey completion. However, since the answers will have no identification, once your survey has been submitted, you will no longer be able to withdraw from participation. If you choose to withdraw in the middle of the survey, the final question gives you the opportunity to have your responses excluded from the final set of data.

The data (de-identified) from this survey will be made available for educational purposes (studying statistical methods); at a minimum, the data will be distributed in its entirety to all students in sections 1, 2, 6, and 7 of MA223 this spring to complete the lab. Summaries of the data may also be used in describing this activity within the educational community. By completing this survey, you are consenting to allow the responses you provide to be publicly available for educational purposes.

Page 2

Demographics

This section collects characteristics about you, commonly known as "demographics." These characteristics will be used primarily to summarize the types of students completing the survey; it may also be of interest to determine if any of these characteristics are associated with a student's water use/knowledge.

What is your current age (years)?

Please describe how you identify your gender (for example, "female", "nonbinary", etc.).

Which of the following best describes your major/degree?

- ○ Engineering (BE, CE, CHE, EE, EngD, ME, NE, OE, SE)
- ○ Sciences (BioChem, BIO, BMTH, CHEM, CS, DATA, MA, PH)
- ○ Both (double major between engineering and sciences)
- ◉ No answer

What was the size of your household before enrolling at Rose-Hulman? "Household" refers to the number of individuals living in your home, including yourself.

Which of the following describes how you are using student loans to finance your education?

- ○ I have student loans in my name.
- ○ All loans are in someone else's (parents, grandparents, etc.) name.
- ○ My education is not financed using loans.
- ◉ No answer

Which of the following best describes where you grew up?

- ○ US, West
- ○ US, Midwest
- ○ US, East
- ○ US, South
- ○ US, Northeast
- ○ US, **Alaska**/Hawaii/Territory
- ○ International
- ◉ No answer

How would you describe your political beliefs?

- ○ Democrat
- ○ Republican
- ○ Nonpartisan
- ○ Other
- ◉ No answer

How would you describe your general position on policies?

- ○ Conservative
- ○ Moderate
- ○ Liberal
- ○ Other
- ◉ No answer

Water Use

This section asks about behavior that contributes to your water use.

Think back on the showers you have taken over the past week. How long (minutes) do you typically spend in the shower (including time it takes for the water to "warm up")?

How many meals *per week* do you eat meat?

Consider all the activities you are engaged in (eating, bathing, washing clothes, watering the lawn, etc.). What is your best guess for your personal water use (**gallons per day**)?

Do not use thousands separators.

Virtual Water Knowledge

"Virtual water" refers to the water used in the production of items we consume (clothing, food, etc.). In this section, we are asking for your best guess on the total amount of water required to produce common items. We want *your* guess; so, we are asking that you complete this without performing any type of search online. It is okay if you are just guessing; that is the point.

How much water (**gallons**) do you think it takes to produce a single sheet of paper?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single cotton t-shirt?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a smartphone?

Do not use thousands separators.

How much water (gallons) do you think it takes to conduct a single session (between 5 and 50 prompts) on Chat-GPT?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of chocolate?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of beef?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single cup (8 oz) of coffee?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of pineapple?

Do not use thousands separators.

Page 4

Water Footprint Education

Before continuing the survey, we want to provide a brief education on "virtual water.

When we purchase an item from a store, we typically do not consider the entire manufacturing process. But, each step in that process requires water. That water use is placed into one of three categories:

- Blue Water: The amount of surface water and groundwater required (evaporated or used directly) to produce an item.
- Green Water: The amount of rainwater required (evaporated or used directly) to make an item.
- Grey Water: The amount of freshwater required to dilute the wastewater generated in manufacturing, in order to maintain water quality, as determined by state and local standards.

When you consider all these sources, it takes **22 gallons of water to make one pound of plastic**. Similarly, **producing one pound of cotton requires 1320 gallons**.

To consider an example, the production of a single 4 oz apple in the US. Apple trees are primarily rainfed (green water, 17 gallons) and can receive supplemental irrigation (blue water, 4 gallons). Most apple trees are treated heavily with pesticides, and can cause water pollution (grey water, 4 gallons) from fertilizer and/or pesticide use. That is, it takes approximately **25 gallons to produce a single 4 oz apple**.

While we tend to focus on our "direct" water use (bathing, washing dishes and clothes), the vast amount of our water use is "indirect" (or "virtual") through our consumption of products.

Page 5

Water Footprint Knowledge, Revisited

Previously, we asked you to estimate the amount of water it takes to produce various goods. We then discussed the concept of "virtual" water and provided a few examples. We would like to you update your estimates on the amount of water it takes to produce those same goods. As before, you should do this without performing any type of internet search.

How much water (**gallons**) do you think it takes to produce a single sheet of paper?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single cotton t-shirt?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a smartphone?

Do not use thousands separators.

How much water (gallons) do you think it takes to conduct a single session (between 5 and 50 prompts) on Chat-GPT?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of chocolate?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of beef?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single cup (8 oz) of coffee?

Do not use thousands separators.

How much water (gallons) do you think it takes to produce a single serving (4 oz) of pineapple?

Do not use thousands separators.

Page 6

Water Footprint

We will now use an established online calculator to estimate your personal water footprint. When filling out the calculator, please do the following:

- Consider yourself a household of 1 (we are only interested in your personal water use).
- When asked where you live, select "Indiana" since we are interested in your water use on campus.
- In general think about your behavior *on campus*; so, you are probably not watering your lawn, and your dishes are generally washed with a dishwasher if eating in the cafeteria.
- Some items allow you to enter an amount with a duration; note that *both* the amount and time duration can be altered (see image below).

After using the water calculator, enter the value (will be given in gallons/day) for your water footprint here.

Calculator: **https://www.watercalculator.org/wfc2**

Do not use thousands separators.

*

Do you grant consent for your responses to be included in the data?

○ Yes ○ No

Close this window