**Systems Modeling Worksheet**

**Experiment 1**

*Experiment 1a — In the Interface level of the Bathtub Model, set the Faucet = 1 liter/second, the Drain = 1 liter/second, and the Water in bathtub = 10 liters. Run the model and observe the results in the Interface level graph.*

What happens to the volume of water in the bathtub over the course of 60 seconds? Why?

Consider a single water molecule entering through the faucet at the beginning of the first model run. What do you think happens to it?

If you doubled the size of the inflow and outflow, what would happen to the reservoir size?

*Experiment 1b — Next, in the Interface level of the Bathtub Model, set the Faucet = 2 liters/second, the Drain = 1 liter/second, and the Water in bathtub = 10 liters. Run the model and observe the results in the Interface level graph.*

What happens to the volume of water in the bathtub over the course of 60 seconds? Why?

How would you describe the rate of change of the reservoir volume?

If you made the drain value greater than the faucet, what would happen to the bathtub reservoir?

If the inflow and outflow values are not equal, can the volume of water in the bathtub reservoir remain at a constant value?

**Experiment 2**

*Experiment 2a — In the Interface level of the Bathtub Model, set the Faucet = 1 liter/second, the Drain = 1 liter/second, and the Water in bathtub = 10 liters. Run the model and observe the results in the Interface level graph.*

How would you calculate the residence time of a single water molecule in the bathtub reservoir in this case?

*Experiment 2b — In the Interface level of the Bathtub Model, set the Faucet = 2 liter/second, the Drain = 2 liter/second, and the Water in bathtub = 10 liters. Run the model and observe the results in the Interface level graph.*

What is the residence time in this case? Compare what is happening to a single water molecule in this model run vs. the previous run.

If you set the inflow and outflow values to 10 liters/second, what would the residence time be?

**Reflection**

One way to improve your learning is to reflect on the experiments you have just completed. How do you think your understanding of the relationship between flows and reservoirs in a system has improved by using the bathtub model in this unit?