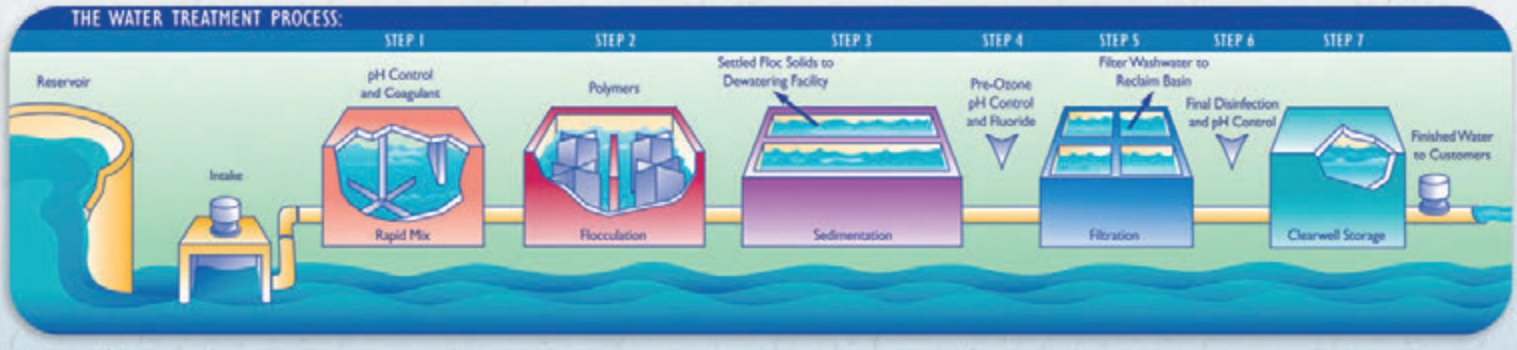
The 6-Step Process to Treating Tampa's Water

Where it begins. Tampa's demand for water averages 84 million gallons a day. Most of the daily demand is pumped from the Hillsborough River reservoir into the water treatment plant. Along with the river water, everything floating in the river also pumped into the facility, so screens keep floating debris from entering the treatment plant intakes.

Step 1. The Hillsborough River has a tea-like color from a naturally occurring organic matter found in Florida streams and rivers. To remove this matter, ferric sulfate and sulfuric acid are added to the water, reacting with the organic matter, and forming particles called floc. This first step is called **Rapid Mix**.

Step 2. During this step, polymers are added to the water to allow the floc particles to adhere to each other and form larger, heavier floc solids. This is called the **Flocculation step**.

Step 3. After flocculation, the water flows into rectangular settling basins where the floc settles to the bottom. The floc is then vacuumed and treated and removed while the clear, settled water is collected at the end of the settling basins. This step is called **Sedimentation**.



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Step 4. The clear, settled water is now treated with ozone, a strong oxidant that destroys harmful bacteria and viruses and inactivating microbial pathogens such as Giardia and Cryptosparidium. Ozone also destroys taste- and odor-causing compounds. Lime is added to the water after ozonation to stabilize the pH balance of the treated water. Fluoride is also added to provide dental benefits in this step, called **Stabilization and Disinfection**.

Step 5. In the **Filtration step**, the disinfected water is filtered through mixed bed filters containing sand and biologically activated carbon coal to remove any remaining particles.

What is know as the Filter Backwash: The filters must be cleaned periodically to remove collected particles. An automated, computerized backwash program removes dirty filters from service and begins a reverse-flow washing process. Without cleaning the filters on a regular basis, we would end up leaving contaminants in the water and it would not be fit for consumption.

Step 6. After filtration, chlorine and ammonia are added to the treated water to prepare it for storage. The combination produces a disinfectant called monochloramine. This is the **final disinfection step** and provides the final residual disinfectant for the finished water, which maintains the disinfectant integrity of the water in the distribution system. Sodium hydroxide is added to produce the final desired drinking water pH before storage for later distribution.

Finished water is stored in large cement underground tanks called clearwells. High service process pumps send the finished water from storage to distribution to our customers.

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Activity:

Simulate the procedures that the David L. Tippin Water Treatment facility uses to purify water for drinking.

Materials Needed

- [ ] 5 Liters of "swamp water" (or add 2 1/2 cups of dirt or mud to 5 liters of water)
- [ ] 1 Two liter plastic soft drink bottle with its cap (or cork that fits tightly into the neck)
- [ ] 2 Two liter plastic soft drink bottles, one with its bottom cut off and one with the top cut off
- [ ] 1 large beaker (2 cups) or measuring bowl that will hold the inverted two liter bottle or you can use another two liter plastic soft drink bottle with its top cut off so the other bottle will fit inside of it.
- [ ] 2 tablespoons of alum (potassium aluminum sulfate available in the spice isle at grocery stores)
- [ ] 1 1/2 cups fine sand (white play sand or beach sand)
- [ ] 1 1/2 cups coarse sand (multi-purpose sand)
- [ ] 1 cup small pebbles (washed, natural color aquarium rocks work best)
- [ ] 1 coffee filter
- [ ] 1 rubber band
- [ ] 1 tablespoon (for the alum)
- [ ] 1 large spoon (for stirring)
- [ ] A clock with a second hand or a stopwatch

Activity (continued)

Procedure

1. Pour your "Swamp Water" into the two liter bottle with a cap.

2. Aeration the first step in the treatment process, adds air to water. It allows gases trapped in the water to escape and adds oxygen to the water. Place the cap on the bottle and vigorously shake the bottle for 30 seconds. Continue the aeration process by pouring the water into another bottle or the beaker, then pouring the water back and forth between them about 10 times. Once aerated, gases have escaped (bubbles should be gone). Pour your aerated water into your bottle with its top cut off.

3. Rapid Mix and Flocculation: Add two tablespoons of alum to the aerated water. Slowly stir the mixture for 5 minutes. You will see particles in the water clinging together to make larger clumps.

4. Sedimentation, Stabilization and Disinfection: Allow the water to stand undisturbed in the cylinder. Observe the water at 5 minute intervals for a total of 20 minutes. Write down what you see - what is the appearance of the water now? At a treatment plant, there are settling beds that collect floc that floats to the bottom, allowing the clear water to be drained from the top of the bed and continue through the process.

5. Filtration: Construct a filter from the bottle with its bottom cut off as follows (see illustration below):

- **a.** Attach the coffee filter to the outside neck of the bottle with a rubber band. Turn the bottle upside down placing it in a beaker or cut-off bottom of a two liter bottle. Pour a layer of pebbles into the bottle - the filter will prevent the pebbles from falling out of the neck.
- **b.** Pour the coarse sand on top of the pebbles.
- **c.** Pour the fine sand on top of the coarse sand.
- **d.** Clean the filter by slowly and carefully pouring through 3 L (or more) of clean tap water. Try not to disturb the top layer of sand as you pour the water.

6. Filtration through a sand and pebble filter removes most of the impurities remaining in water after coagulation and sedimentation have taken place. After a large amount of sediment have settled on the bottom of the bottle of swamp water, carefully - without disturbing the sediment - pour the top two-thirds of the swamp water through the filter. Collect the filtered water in the beaker. Pour the remaining (one-third bottle) of swamp water back into the collection container. Compare the treated and untreated water.