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Eight Rivers Essay

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## Saving the World's Water Quality

Access to clean water is a privilege with which only few people are blessed. All around the globe, clean, sustainable water is rare, and this scarcity is causing many people to suffer. Water quality across the globe is dwindling, and the only people to blame are ourselves. Man-made chemicals and pollutants are diminishing our waters. Fertilizers and pesticides used on crops are soaked into the soil and eventually make their way to streams. Chemical waste products from industrial processes are sometimes drained into bodies of water, releasing harmful chemicals among aquatic organisms living there. Factories extract water from rivers for powering and cooling down equipment, and then drain dirty water back into rivers. Among some of the worst sources of pollution that effect water quality are pipelines. Pipelines draw complex pictures across our country's map and are responsible for some of the most destructive impacts on U.S. waters and the environment. Water provides to the entire environment and it's inhabitants; it is key to our survival, so we must protect it (Fractracker Alliance).

The Mountain State, otherwise known as West Virginia, is blessed with many environmental beauties. From wild ranging mountains, to endless views of trees, all the way down to the streams. West Virginia is the proud birthplace of eight rivers including: Cherry, Cranberry, Elk, Gauley, Greenbrier, Tygart Valley, Williams, and Cheat. These rivers source from the heart of Pocahontas, Randolph, and Pendleton Counties located in a portion of the Allegheny Mountains in eastern West Virginia (West Virginia Explorer). These rivers go on to flow and provide water throughout the country, so they must be protected. Monongalia National

Forest protects the birthplace of these rivers, but as they continue to flow further away from their source, they become increasingly susceptible to chemicals and other pollutions which can dramatically cause water quality to decline (West Virginia Rivers Coalition).

I live in Pocahontas County, West Virginia and have been monitoring the health of streams in my county for five years. I conduct many tests including Alkalinity, Phosphates, Nitrates, Iron, and Dissolved Oxygen. I also record the temperature of the water, clarity, smell, and color. A significant threat to the water quality in my area began two years ago when the United States Pipeline began executing a plan to run a pipeline straight through Pocahontas County and the rivers that reside here. At the sound of this news, I continued to conduct water quality tests and expanded my range to include bodies of water that were along the fixed route of the pipeline, meaning that those bodies of water would be crossed by the pipeline. I did this to test and monitor any fluctuation in the water quality in my area.

There is an abundant number of water sources that flow through West Virginia, however, there are also multiple major pipelines decussating their way through the mountains, valleys, and streams including the Mountain Valley Pipeline, Atlantic Coast Pipeline, Mountaineer Xpress Pipeline, and Rover Pipeline (State Agency Directory).

Pipelines are a common transportation method for disbursing hazardous liquids, raw materials, crude oil, and natural gases. Pipelines are the most convenient, fastest, and safest way to transport natural gases throughout the country compared to other methods. In just the United States alone, there are 2.6 million miles of pipelines, and 18,000 places where a pipeline crosses a river, lake, or stream. Pipelines carry numerous chemical substances, depending on the company and supplier, and this affects the initial size of the pipes and the material used to compose them (Fractracker Alliance). Since 1969 there have been 44 major oil spills resulting in

10,000 barrels (460,000 gallons) of oil each spill that contaminates U.S. waters, and destroys wildlife (Auburn University).

If the United States Pipeline runs through Pocahontas County, water quality in my area will experience a major decline which can be proven by my previous research and data conclusions. Many problems could arise from this process and affect water quality, including but not limited to, machinery waste, sediment runoff, and the transportation of chemicals which could result in leaks (Fractracker Alliance).

Pipelines, in my opinion, are a well-kept secret. Everyone seems to know about their existence, but unless you look closely, they are oblivious to the human eye. If you think about it, when you are traveling down an interstate, a highway, or even a dirt back road, do you ever notice a pipeline? Pipelines are carefully hidden and so that they are not questioned by the public. If everyone could see a pipeline crossing a river, a lot of people would question the affect that could have on disrupting the environment. Pipelines breaking through ecosystems is not witnessed enough by the public for suspicions and concerns to be raised against this harmful act.

I believe that the pipeline crossing through Pocahontas County is indeed inevitable, so my proposed solution to this problem would be to engineer a new type of instillation that would coat the inside of the pipes that are used to transport chemicals. The pipes used in pipelines today are either steel, carbon steel, or even plastic, which are usually buried (Wikipedia Organization). Depending on the chemical being transported, the build of the pipes varies. I believe a new type of installation is necessary since one of the leading causes of leaks in pipelines occurs when the water in the oil reacts with the steel infrastructure causing the pipes to rust and eventually burst. Water from the oil being transported mixes with dirt to create a breeding ground for bacteria, which produce sulfur, furthermore aiding corrosion in the pipes (Save Our Soil Organization).

Therefore, coating the inside of pipelines with a type of waterproof substance such as rubber, silicon elastomer, or fluoropolymers would help to decrease the risk of rust and leaks.

These water-repellant coatings would help to keep the water in the oil from reacting with the steel pipes, therefore extinguishing the probability of rust leading to leaks, and thus keeping pipelines in standard condition. Rubber, silicon elastomer, and fluoropolymers are all water-repellant substances that could withstand conditions in pipelines. Rubber is extremely durable, waterproof, and can be used extensively in many applications upon virtually any material. Silicon elastomer is widely used in industries, is non-reactive, and can withstand extreme temperatures. Fluoropolymers are best characterized by their ability to have a high resistance to solvents, acids, and bases (Wikipedia Organization). I believe substances with such properties would do an excellent job as an instillation coating to help reduce corrosion within pipelines.

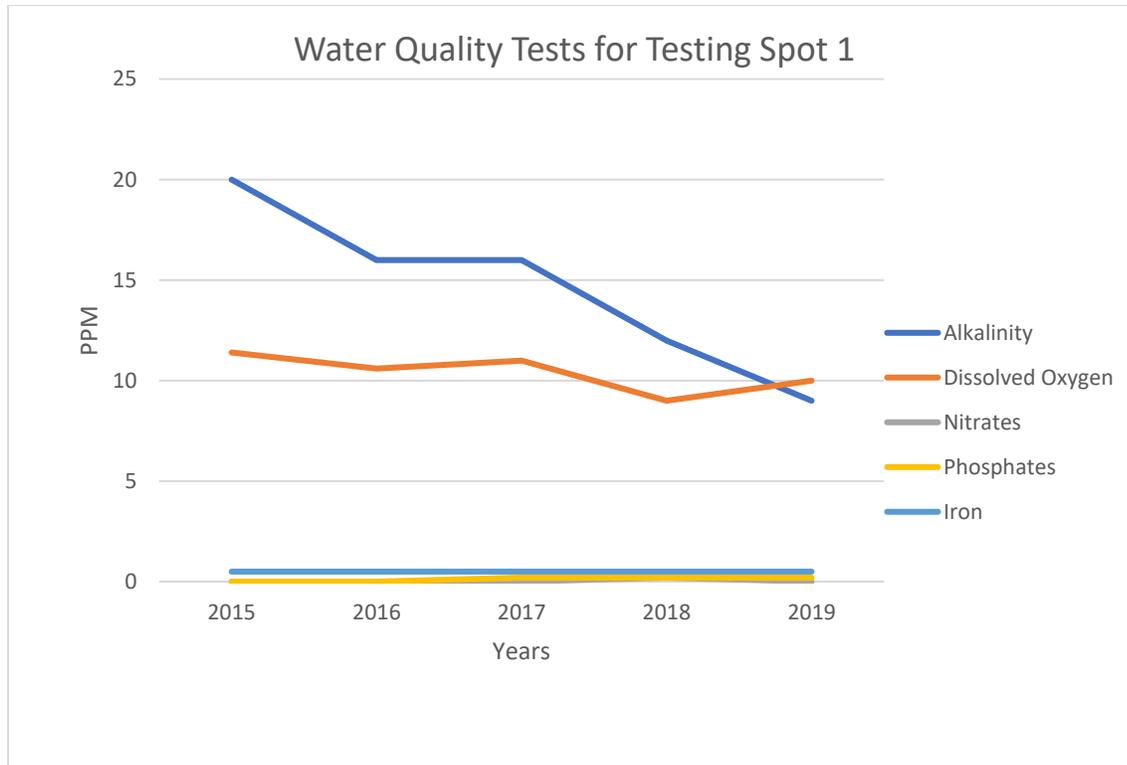
Over the years, the results for the water quality tests that I have conducted indicate that there is a visible affect prompted by the construction of the pipeline, thus causing chemical levels to alter. The following line graphs depict the results of the water quality tests that I have conducted myself over the course of 5 years. Some locations have 5 years' worth of data, while other locations only have 3 years' worth of data.

I conduct five chemical tests. Alkalinity measures the amount of lime in the water and the resist in pH levels. Nitrates refers to the amount of nitrate present and this is also a common contaminant. Dissolved Oxygen measures the amount of oxygen present in the water. Phosphates measures the amount of chemicals in the water containing phosphorus which results in excessive algae growth. Iron measures the amount of iron present in the water (Mountain Institute).

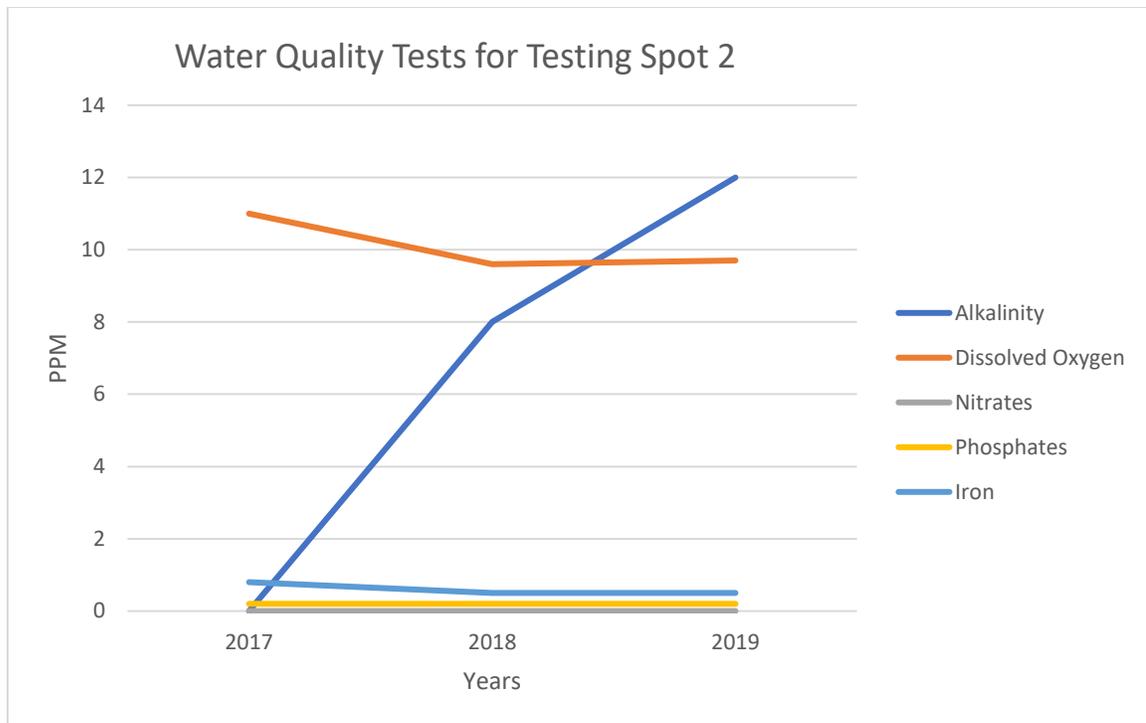
The following list indicates what my test results should be in close proximity to, and please keep these values in mind when looking at the following graphs (Mountain Institute):

- Temperature: Depends
- Alkalinity: Greater than 21.4 ppm
- Nitrates: Less than 4 ppm
- Iron: Less than 10 ppm
- Phosphates: Less than 0.1 ppm
- Dissolved Oxygen: 5 fine, 9 good, 11 awesome
- Biodiversity and plant life will depend due to time of year.

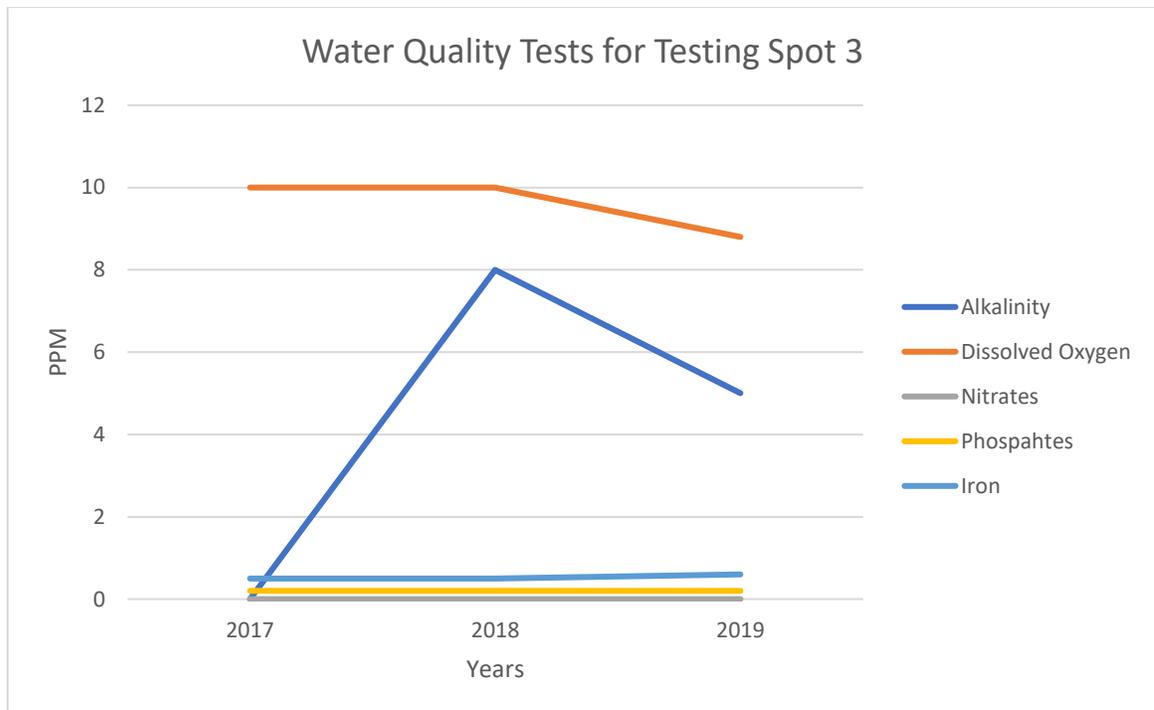
The first testing location is my house which is located in Boyer, WV. The second testing location is downstream about 2 miles also in Boyer. I made these testing locations so close to each other to see how the water quality can change even over short distances. The third testing location is in Green Bank, WV and is known as Deer Creek. The fourth testing location is in Dunmore, WV which is about 30 miles down from the first testing location.



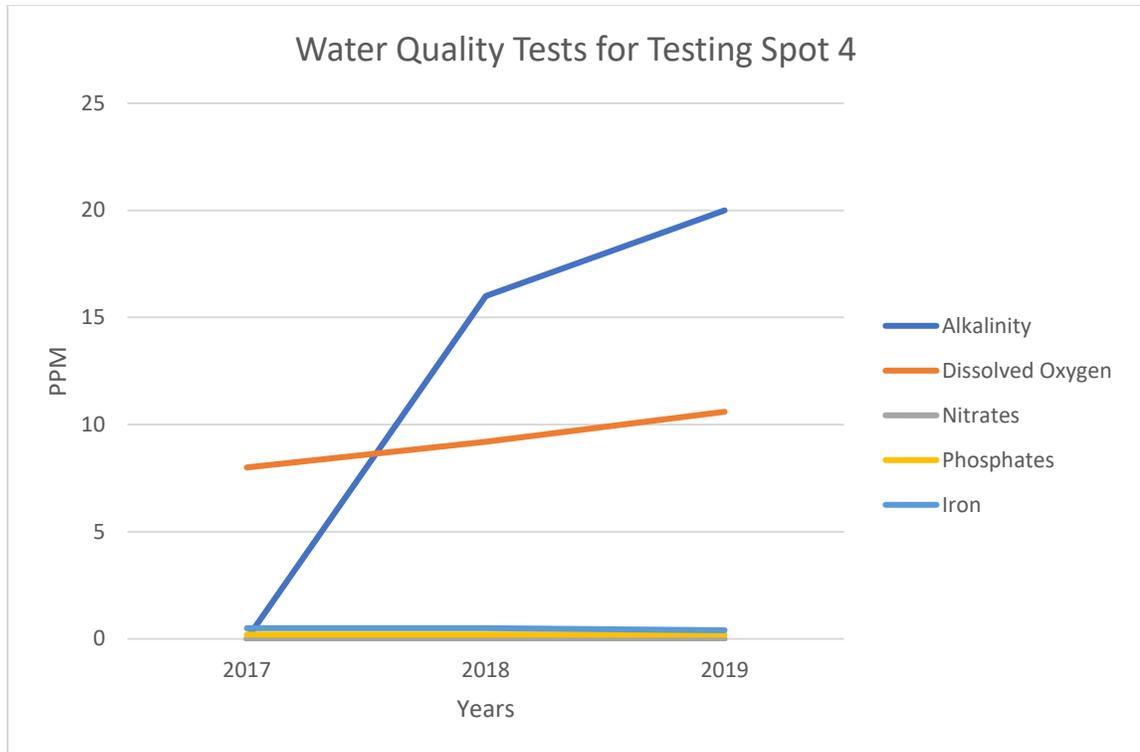
Testing Spot 1: At testing spot 1, the alkalinity level had a visible decrease. The dissolved oxygen had an over all decline, while phosphates increased slightly, iron decreased slightly, and nitrates never changed. As you can see, when the pipeline started construction between 2017 and 2018, there is a visible decline in both alkalinity and dissolved oxygen, and phosphates increases slightly. This is not a good overall change.



Testing Spot 2: At testing spot 2, the alkalinity levels increased dramatically, and the dissolved oxygen levels slightly decreased. Phosphates and nitrates levels stayed the same, while iron slightly decreased. As you can see, when the pipeline started construction between 2017 and 2018, there was a huge increase in alkalinity levels, but there was a decrease in both dissolved oxygen and iron. This creek does not represent healthy levels because at the beginning of pipeline construction my alkalinity levels were reading 0 ppm, and my iron was higher than usual.



Testing Spot 3: At testing spot 3, the alkalinity levels increased, peaked, then decreased. The dissolved oxygen levels stayed the same and then decreased slightly, while the phosphates and nitrates levels stayed the same, and iron increased slightly. As you can see, when the pipeline started construction between 2017 and 2018, dissolved oxygen levels remained unchanged while alkalinity levels started extremely low and rose. The water quality at this stream during the start of the pipeline does not appear to be anything to be concerned about, but you can see how the pipeline's construction can alter the water quality so dramatically.



Testing Spot 4: At testing spot 4, the alkalinity levels increased each year, while the dissolved oxygen levels increased slightly. Phosphates, nitrates, and iron all remained the same over the years. As you can see, when the pipeline started construction between 2017 and 2018, both alkalinity and dissolved oxygen levels rose from being extremely low over the course of one year. Iron also appeared to be slightly higher than usual, and phosphates and nitrates both remained low. Again, you can see how the start of construction on the pipeline can impact the environment and effect water quality.

Maintaining a healthy water quality is essential for the environment, and with the threat of the United States Pipeline this goal is even more important to maintain, especially in the birthplace of many rivers that flow into and throughout the country. Engineering a waterproof instillation to coat the inside of pipelines could be the next step in decreasing the number of oil leaks, and most importantly, the effect this has on water quality. I believe this will not only

benefit West Virginia waters, but furthermore, American water quality. The world could benefit so much if the increasing threat of oil leaks could be diminished. This could save countless environments, oceans, and most importantly, help to keep water quality around the world pure and thriving.

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