

A Cleaner Life

School: Navajo Preparatory

Area of Science: Environmental Science

Team 77

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Abstract:

On the Navajo Reservation, water has always been a major source of life; however, this water has not always been completely sanitary. Unsanitary water can result in diseases such as: Shigella, (fecal-oral contamination) a potentially dangerous case of diarrhea, Escherichia Coli (E. coli) and other dangerous waterborne diseases. In our project we will attempt to, using computers and programming, find the best way to sanitize the dirty water. If effective, this could potentially turn into a community well-ness effort for the different chapters among the Navajo Nation.

To complete this project we need to do extensive research and report about the different kinds of pollutants on the Navajo Reservation. To find the fastest and most cost effective way to clean dirty water, we will need to also research the counter-chemicals that will attack and neutralize the pollutants.

Objective: The main purpose of our project is to find the most effective way to sanitize water from the wells of the Navajo Nation by using computer programming and analysis.

Problem: On the Navajo Reservation, water has always been a major source of life; however, this water has not always been completely sanitary. Unsanitary water can result in diseases such as: Shigella, (fecal-oral contamination) a potentially dangerous case of diarrhea, Escherichia Coli (E. coli) and other dangerous waterborne diseases. In our project we will attempt to, using computers and programming, find the best way to sanitize dirty water. If effective, this could potentially turn into a community well-ness effort for the different chapters among the Navajo Nation.

Question: What would be the required, and the faster most efficient, time and the amount of neutralizer required, in minutes or hours (depending on the pollutant), to completely sanitize the water samples.

Data: The following researched pollutants are among the “most” drastic that has been found in water wells.

Nitrite (N)

Nitrite compounds are a natural occurrence in water, soil and plants. It is formed to break down substances such as manure and dead plants. Nitrite gets into water by seeping in through nearby factories, landfills and septic tanks. The United States Environmental Protection Agency recommends water sources be tested for nitrite compounds. It is recommended by the government to only have 10ppm of nitrite in a given amount. Harmful effects of excess nitrite compounds in the body are more susceptible to pregnant women and infants. When nitrite reacts with hemoglobin in the blood, oxygen is slowed in the blood stream.

Ammonia Nitrogen (NH₃-N)

The hazard of ammonia nitrogen in water is based on the amount of contaminant present. When the amount of ammonia nitrogen is low it is usually because of biological decomposition of plants or animals. When the amount of ammonia nitrogen is high it can be conferred that the water has been contaminated from sewage or industrial waste. The toxicity of the water is determined by temperature and acidity levels. A warmer and higher temperature and pH means for higher concentrations of ammonia nitrogen. If contaminated water is ingested, it may cause seizures and even death in a human.

Chloride (Cl)

Common forms of Chloride are NaCl and MgCl₂. It is formed from chlorine, which is highly toxic by itself. It is usually used in disinfectants and other cleaning uses in industrial aspect. Thus, it can be found in high amounts near factories and treatment plants. Large amounts of chloride in freshwater is harmful to certain fish. In a normal adult human, there are about 82 g of chloride. The recommended intake for adults is 9mg of chloride per day. Excessive amounts of chloride intake can be endured by healthy people. In water, high amounts of chloride show the water has high amounts of metal because chloride is easily conducted by water.

Procedure:**The “Actual” research;**

To have a probable solution for the project, we will need to help of the rural communities in order to come into possession of the technologies that will be needed for the purification process, a science fair “like” approach will be needed for the proper ratio to be inputted in the *Starlogo* programming.

The Following steps will need to be taken:

1. Testing of the water pollutants will be necessary to acquire the proper ratio of pure water to pollutants.
2. Next, research on the pollutants found in the water will be essential for the ratio between pollutant to neutralizer.
3. These ratios will be inputted in the *Starlogo* programming to find to proper timing that will be needed for the neutralizing process of the water.
4. Once the ratios are inputted, the process will begin once again for another pollutant found in the water.

The Computation Aspect:

For our project we will need to complete extensive research for the computing aspect because this will eventually become the most intricate portion of the project. If the coding is not done correctly, the program will not operate to the desired conclusion.

The coding will work as followed:

1. The study of the water and the pollutants will give us the proper ratio between the pollutants and neutralizer. This ratio will fuel the programming that we will create.
2. This information inputted into the programming that we have created.
3. When inputted, the information will dictate both the movement and the actions of the turtles in the programming.
4. The ratio between pollutants and neutralizers will dictate the both the movement and designation of the *Turtles* in the *Starlogo* program.
5. The coding will be set to input to different particles; the pollutant and the neutralizer.

6. The pollutants will be a designated color, as well as the neutralizer, and when the neutralizer comes into contact with the pollutant, the color the pollutant will change. This transition will be the main goal of the neutralizers throughout of programming.

It is essential that the data gathered is correct or the consequences will be great. If the data is not to the exact specifications, the conclusion of not only the programming will be incorrect, but the entire project will be through out of proportion.

The Coding Used:**Turtle Procedures:**

```

to place-unique
  setxy random screen-width ( ( random 63 ) - 9)
  if count-turtles-here > 1
  [ place-unique ]
End

```

Observer Procedures:

```

breeds [ pollutants detox water ]
to setup
  ct
  if %pollutants + %detox < 100
  [
    create-pollutants-and-do 3150 * %pollutants / 100
    [ setcolor red
      setshape evil
      place-unique ]
    create-detox-and-do 3150 * %detox / 100
    [ setcolor green
      setshape good
      place-unique ]
    create-water-and-do 3150 * (100 - %pollutants - %detox) / 100
    [ setcolor blue
      setshape to'
      place-unique ]
  ]
end

```

Conclusion: In conclusion, we found that the actual technology, meaning the filtration and purification methods already utilized by many other communities around the world in need of clean water, which would be needed to be used to purify the water, would be too costly for rural environments and communities. The Computation aspect of the project can only go so far, the project will need to be introduced into the rural communities throughout the Navajo Nation via Chapter meetings out reach programs.

It was found that the pollutants, the ones that could be dangerous to Human beings, were not in abundance in one of the testing sites and would there for void the purification process to a minimal. The one site that did contain a hazardous amount of pollutant was that of the Sample taken from the well in which the water gathered was not to a proficient depth so the runoff and top-contamination would not be evident. However, this pollutant had a very “cost friendly” and therefore did not requires a drastic amount of decontaminate for the purification process. The time need, as found by the *Starlogo* programming, was of proficiency and could therefore be applied to certain methods of purification. The time was minimal, be that chemical processes take a very negligible time requirement, and therefore gave us “real time” feedback as to what the time requirement would be for the purification process. Actual date will be revealed at the presentation.

Sources:

1. “Concerns About Livestock Wells”, <http://navajopublicwater.org/Livestock.html>
2. “Finding a balance: water rights for Native Americans, others uncertain”
<http://www.freewmexican.com/news/55299.html>
3. Surface & Ground Water Protection Department
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