



Managing Emerging contaminants in the Connecticut River Watershed

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Introduction

Emerging contaminants (ECs) are found in bodies of water all around the world and are very toxic to the environment. ECs are not only toxic to the environment but to human health as well. These substances or compounds are increased from things like pesticides, the pharmaceutical industries, and things such as self care products. They can come from places like hospitals, expired drugs, household discharge, and waste from animal operations. Most importantly, having an increase in concentration of these ECs are affecting the rate of climate change in a negative manner. These ECs can come from point sources or nonpoint sources. This means that they are able to identify where exactly they are coming from, or when talking about nonpoint sources, we are not able to tell where the pollution is coming from. These toxins have been proven hazardous for the health of humans and health of the environment. They are known to alter the lives of aquatic ecosystems, and cause diseases to people such as endocrine disruption. In respect to trying to solve these issues some techniques like reverse osmosis and ozonation. However, these solutions are extremely expensive to perform.

Objectives and Hypothesis

Hypotheses:

1. There is an increase in ECs in water bodies all over the world, including the local Connecticut River Watershed
2. Emerging Contaminants are having negative effects on the environment but also human health

Objective:

1. research and touch upon strategies to help stop the increase of ECs

Table 1. Facts about Emerging Contaminants

	Wastewater and sewage treatment plants (including hospital waste)	Animal Husbandry	Household discharge	References
Main classes of compounds	Antibiotics, Analgesics, Anti-inflammatories, Cystostatics, Anaesthetics, Disinfectants, Rare-earth elements, Heavy metals, and Iodinated contrast media	Veterinary Antibiotics, Native and steroid hormones (Progesterone, Anabolic progestin, testosterone, androstenedione)	Expired medicines, Unused medicines	Pal et al. (2010); Ternes and Joss (2006); Schuster et al. (2008) and Kümmerer (2001)
Loading of ECs in water	Worldwide Annual average per capita consumption of pharmaceuticals (15 g) More consumption of pharmaceuticals in developing countries (50–150 g per capita per year)	Concentration of Progesterone (gastagens) in rangeland runoff and concentrated animal feeding operation (CAFO) 375 ng/L Concentration of androgens is 10–100 ng/L and estrogens is 650 ng/L in dairy lagoons of California	In Germany, 60–80% of drugs are disposed either in toilets or with household waste	Kolodziej et al., 2004, Scheytt et al., 2006 and DeQuattro et al. (2012)

Background

In many studies, it has been proven that Emerging Contaminants are destructive to the environment all throughout the world. These studies have proved that not only will ECs affect the environment, but they affect all living things. Strategies can be used to try to eliminate ECs to make water more safe.

Wilkinson et al. (2017) looked into ways the emerging contaminants have entered the environment causing risk to aquatic ecosystems. He states that “Many of the products and drugs used commonly contain chemical components which may persist through sewage treatment works (STW) and eventually enter the aquatic environment.” Another study done by Sichel in (2011) worked with UV advanced oxidation treatments to remove Emerging contaminants from water sources. Talib and Randhir (2016) studied “emerging contaminants (ECs) are posing a major threat to health and environment. These contaminants pose a threat to humans and to ecosystems.” That there needs to be something done about it whether that be with structural or non-structural approaches.

Methods

The methods used in this research consisted of studies found and reviewed in Google Scholar. Data was collected from the program BASINS. This poster mainly focuses on educating the effects on emerging contaminants and how they are increasing and affecting the health of the environment.

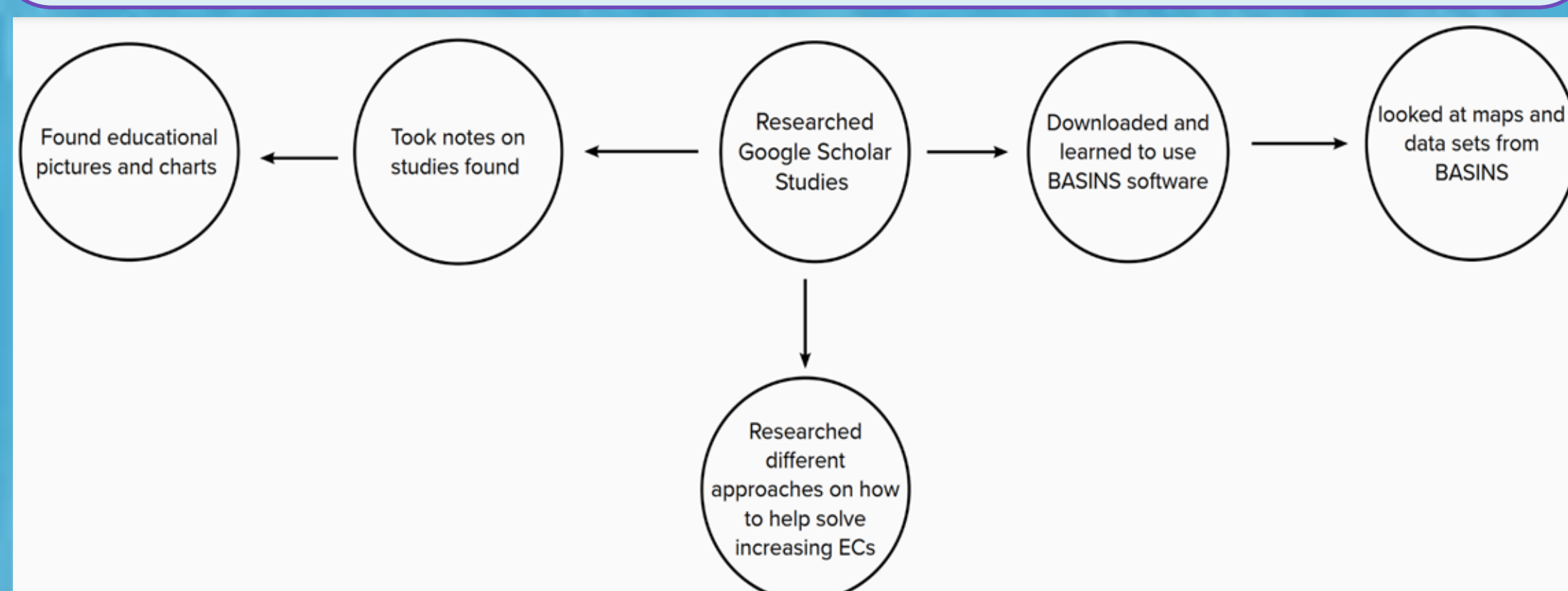


Figure 1. Flow chart

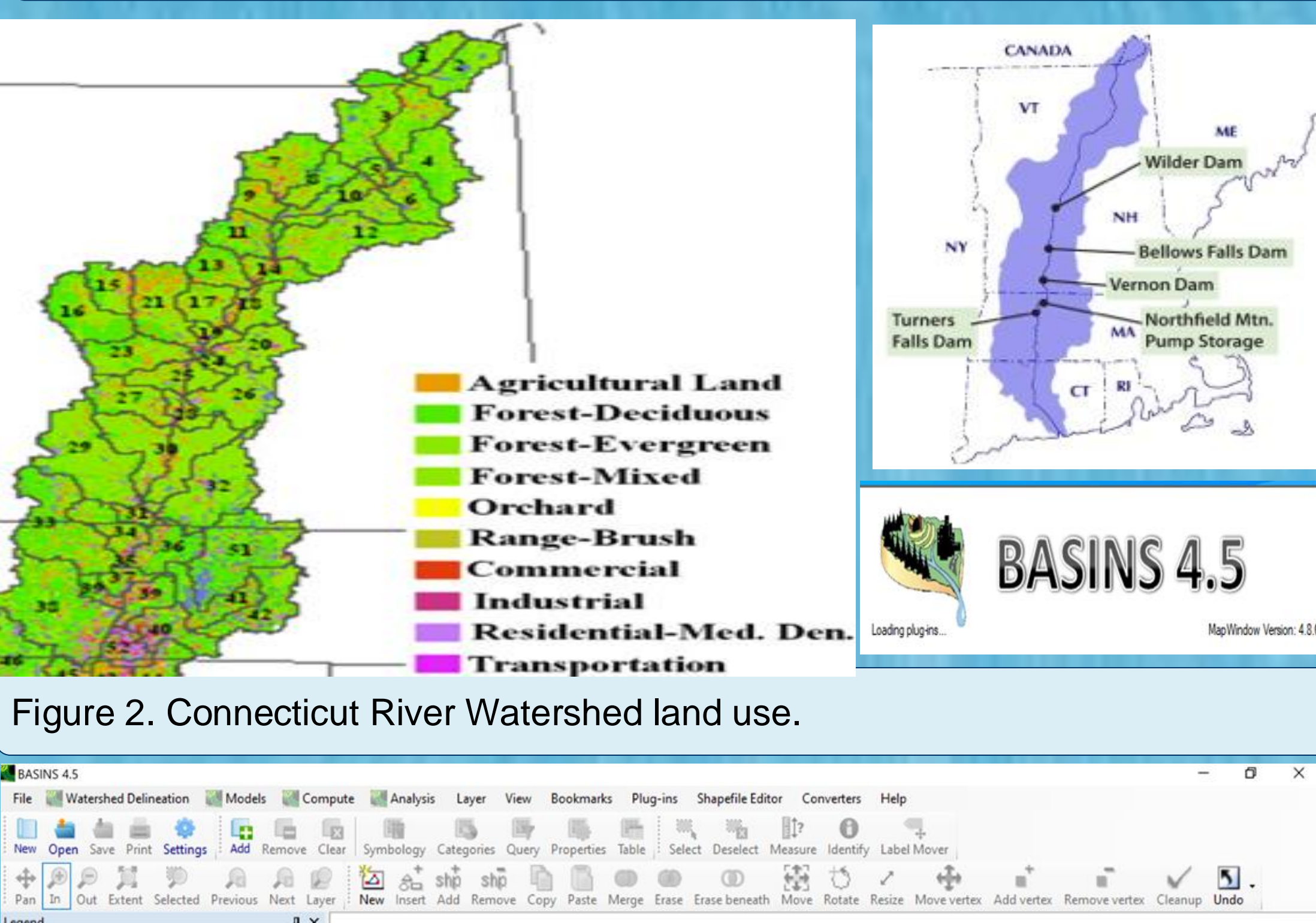


Figure 2. Connecticut River Watershed land use.

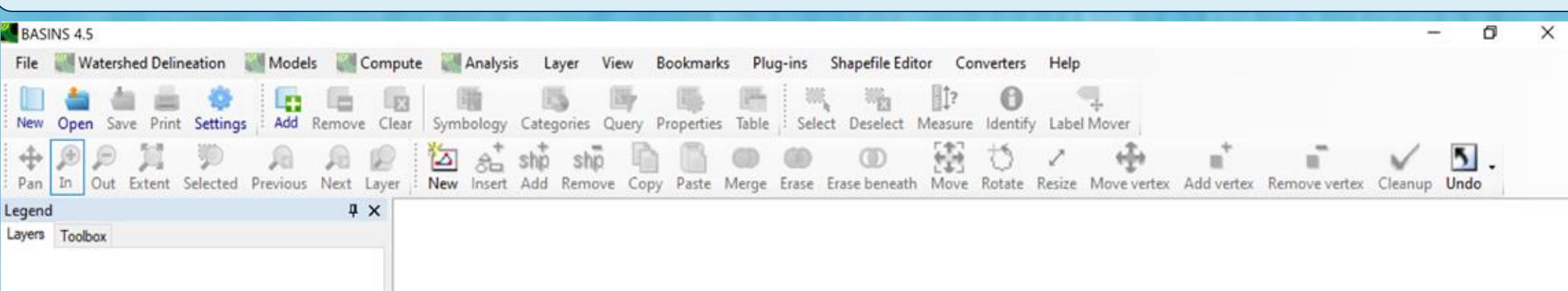


Figure 3. BASINS startup.

Results/Discussions

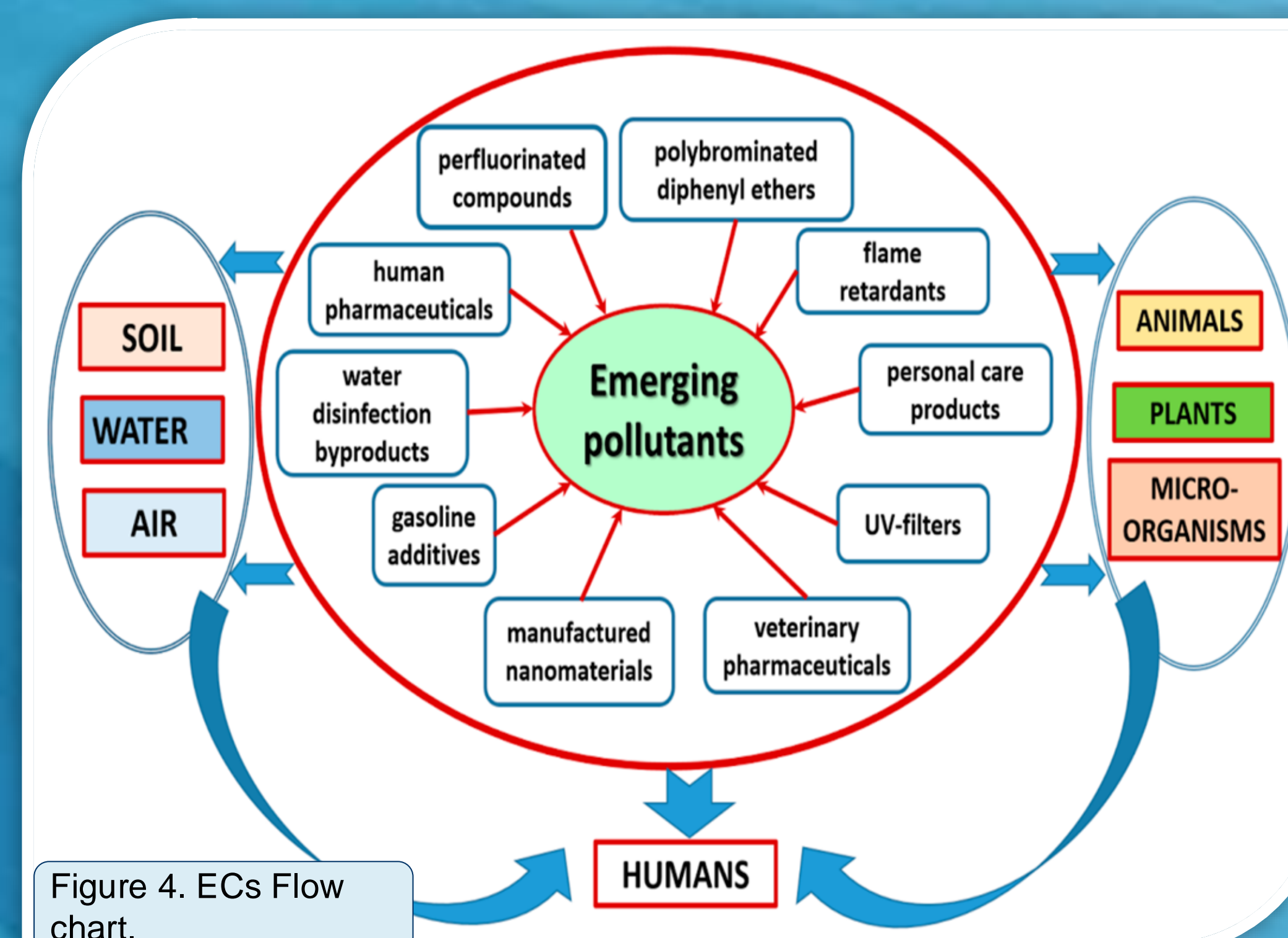


Figure 4. ECs Flow chart.

As seen above, Emerging contaminants can be caused by many things. With that, these EC's will then affect humans and the environment around us. EC's even affect water bodies around us including the Connecticut River Watershed. Map of the watershed and its different land uses are shown below.

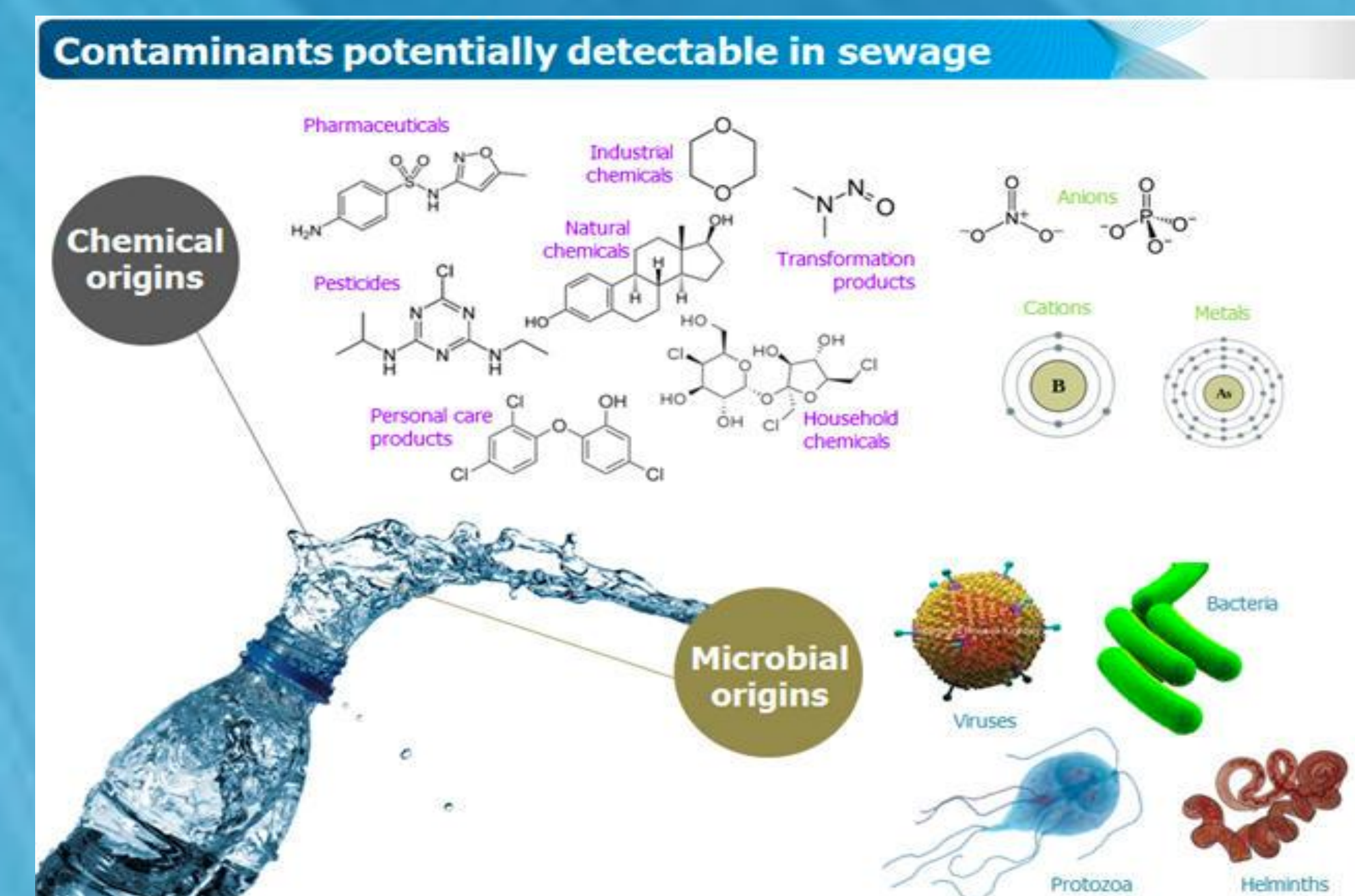


Figure 5. This picture shows ECs in water that we drink.

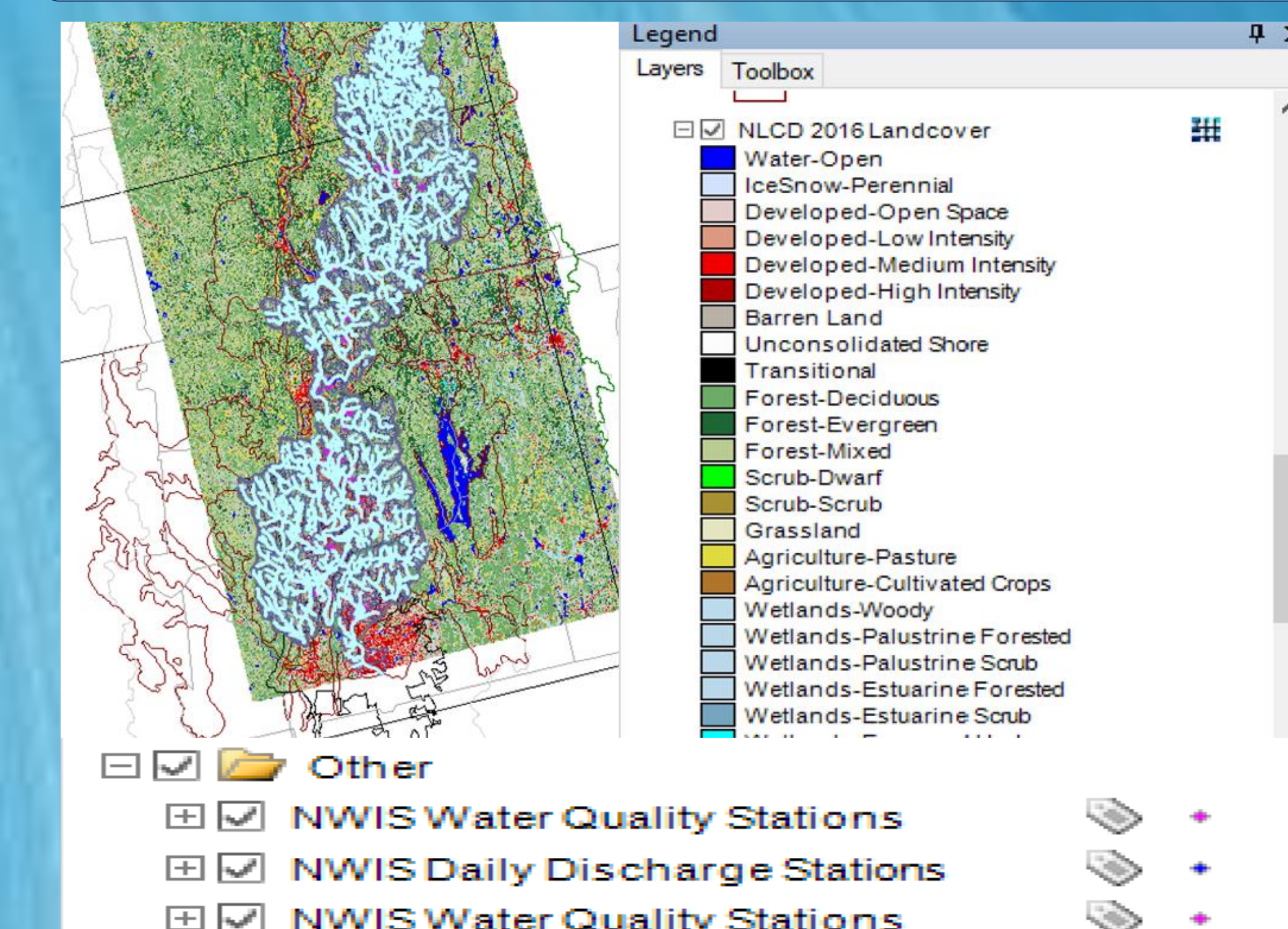


Figure 6. BASINS map and legend.

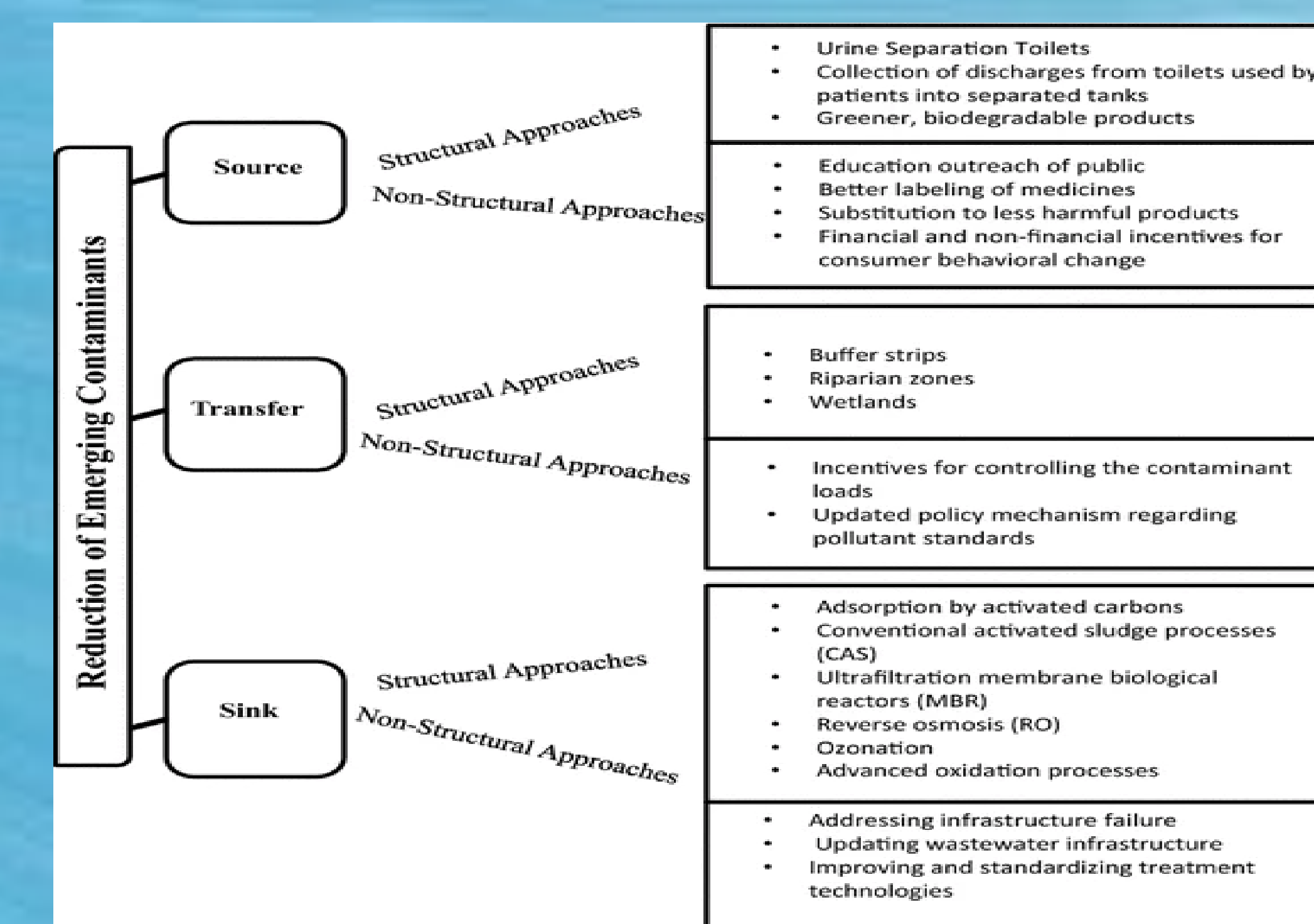


Figure 7. Approaches to help reduce emerging contaminants

One approach is public education. This can be done in a few different ways. One being social media posts, another being hanging up or presenting posters. With this you could either reference research articles, bring up real life scenarios or share your own experience. Another approach could be more structural. An example of this would be Ozonation.

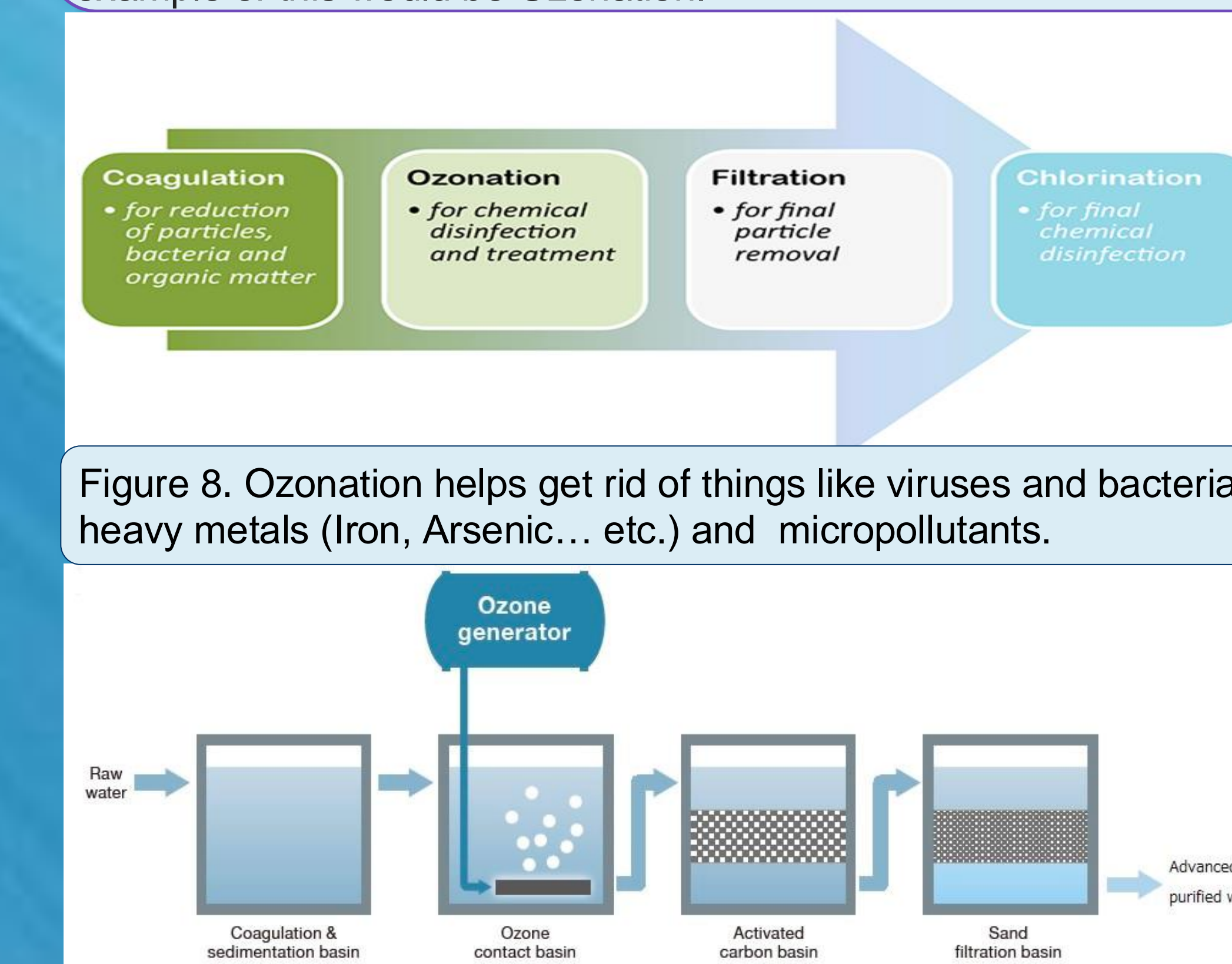


Figure 9. The process of ozonation in water treatment

Conclusions

The biggest takeaways from this project that I would like to acknowledge are first, the fact that emerging contaminants are increasing in water bodies even in areas near us (Connecticut River Watershed). Also the fact that there are approaches that can be done by the community to help this issue. For example making and presenting posters, attending a climate change protest and connecting with others. There are many ways that we can get involved to help stop the increase of emerging contaminants. Because these ECs are increasing more people throughout the world are getting diseases and dying.

Acknowledgements

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