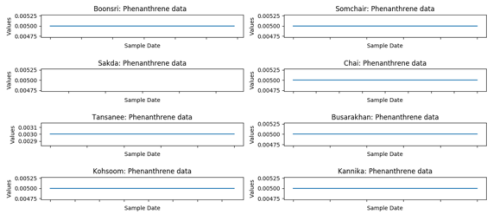
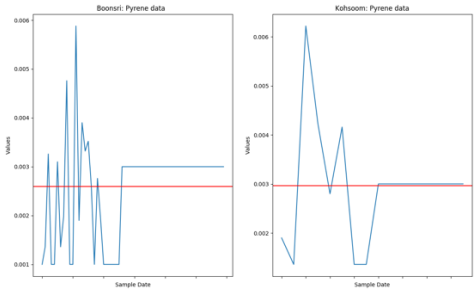
Q1) **Characterize the past and most recent situation with respect to chemical contamination in the Boonsong Lekagul waterways. Do you see any trends of interest in this investigation? Your submission for this question should contain no more than 10 images and 1000 words.**

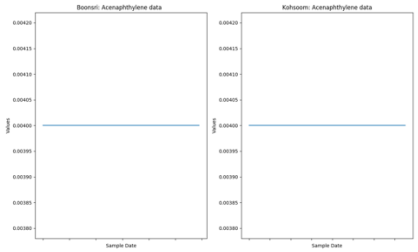
Kasios Furniture Company had denied the industrial waste dumping allegation. Before an investigation had been placed against them but findings were not satisfactory. Therefore, we need to invest using different approach "*analysis of water sensor data*". The sensor data set contains more than 100 chemical data readings for ten different locations over the 18 years' time period.

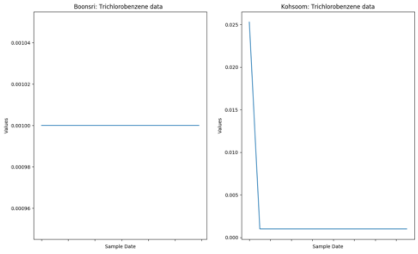
In our investigation, we are searching for chemical components that contains chemical waste dumping. So, not all of those readings are essential for our analysis. If Kasios Furniture Company had dumped their industrial waste in water, there would be several chemical particles presence in water sample and some substances will be higher than normal level. To make our analysis useful, I have selected 10 particles that can be found in chemical waste in significantly amount using environmental safety data. The selected particles are Phenanthrene, Pyrene, Acenaphthylene, Anthracene, 1,2,3-Trichlorobenzene, Endosulfan, Methoxychlor, Lead, Mercury, and Cadmium. For this question, I have assumed that data are taken in timely manner and accurately. 7 Out of 10 substances are non-organic chemicals. Those are man-made and used for dyeing or burnishing the furniture. By analyzing the data set, I have found the significant amounts of those particles in water sample in different locations. Some are in constant rate and others show decaying behavior over the time. Lead, Mercury, and Cadmium are available in nature, but it also maintains a safe level in water. In our data set, the level of Lead, Mercury, and Cadmium had crossed the safety limit in the past. But it shows stable in the recent sample data. Phenanthrene data for most of the location are constant over the years. Data are missing for several sample date. Using available data set, we

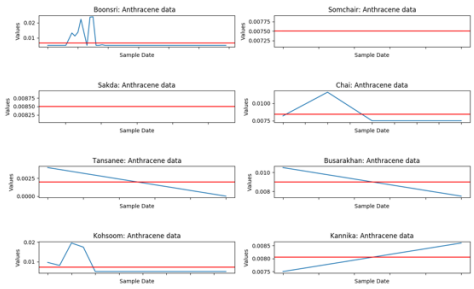
cannot say that the company dumped their industrial waste in the water. For Pyrene, we have data only for two locations. Initially, sample data were changing with sample date. But it becomes constant w.r.t sample date in the recent dates. Pyrene is a compound that is used for dyeing. It is not natural substances. The only chance to get it in the water, if Kasios Furniture Company dumped it industrial waste.

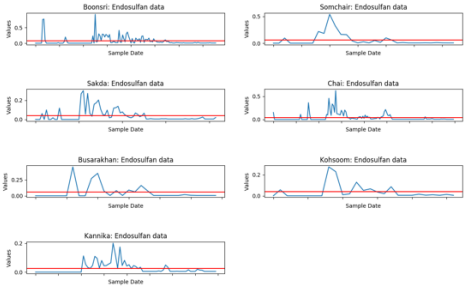


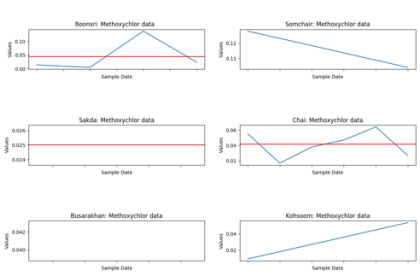


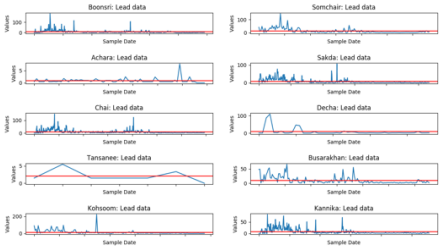


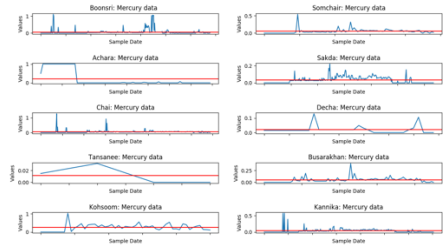


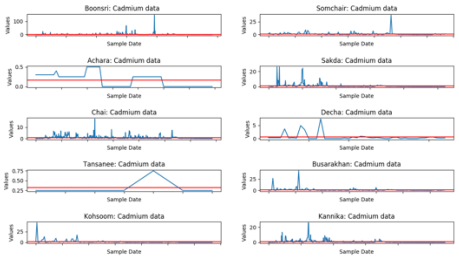












Interesting Trend:

The sample data were taken over the 18 years period. Initially, all the substances can be found in the data set for most of the locations over 18 years period. Some data are missing due to inappropriate sample method. Others may find in water in a small amount that also exists higher than safe level. All those evidences proof that Kasios Furniture Company had dumped their industrial waste in the water. When the questions are risen regarding the environmental pollution, they have stopped dumping chemical waste. Therefore, all the particles are in the water sample either maintain constant or decreasing in the recent years data.

Q2) **What anomalies do you find in the waterway samples dataset? How do these affect your analysis of potential problems to the environment?**

There are few anomalies in the sample dataset. Missing data for several locations and sample dates are big issue. For example, Pyrene data are only available for two locations: Boonsri and Kohsoom (fig 1). To get good analysis results, we need as much as more data which are taken from all over

the preserve. An enriched dataset helps to find patterns during analysis more accurately. Therefore, the proper collection of data across the preserve different locations and time will be helpful for our analysis. The problem is given dataset that sometimes it has only few sample data for a specific particle for a sampling location. For Acenaphthylene data, the dataset has only few data for Boonsri (fig 2). That is quite impossible to assess the potential impact to the environment using those data.

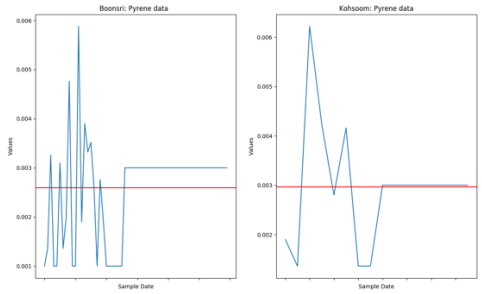


Fig 1: Pyrene data

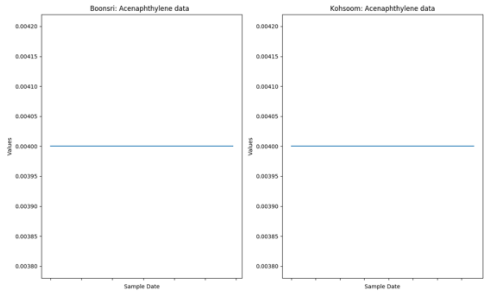


Fig 2: Acenaphthylene data

Is the Hydrology Department collecting sufficient data to understand the comprehensive situation across the Preserve?

Hydrology Department did not collect the data in appropriate manner. In the data set, several data are missing. For some particle, the sample data were taken one or two time over the whole time period. Sometimes they had collected data only for a specific location. Overall, the data set shows inconsistency regarding sample data, sample rate, sample date, and location.

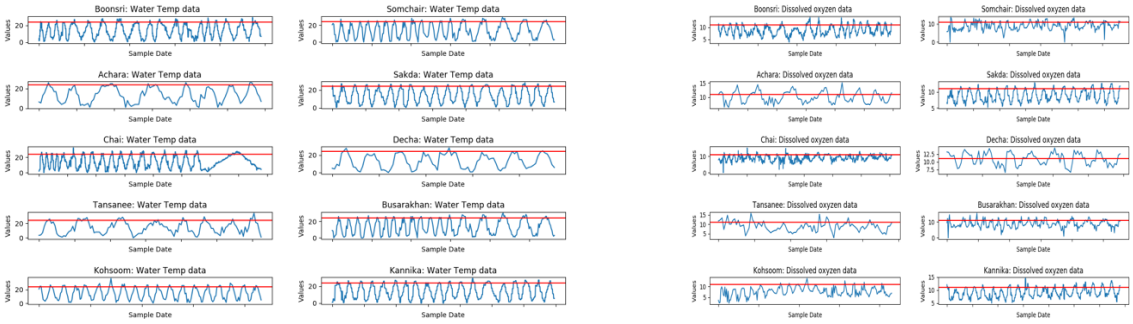
What changes would you propose to make in the sampling approach to best understand the situation?

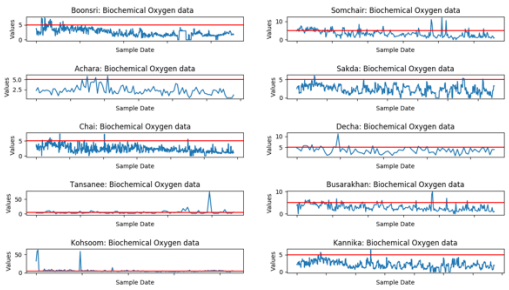
The data sample were taken from ten several locations across the preserve. The sampling locations are well planned and constructs a network. The damping site is located to Sakda sampling location. It will be helpful if they add one more sampling location which is nearby to the dumping site. For

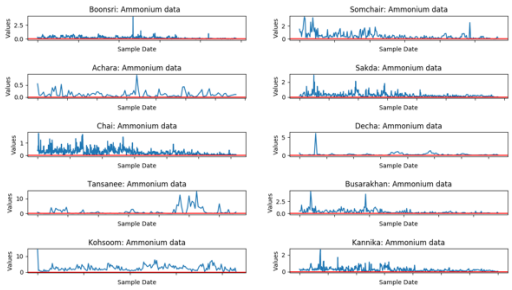
acquiring sample data, they may introduce parodically system. In the current data set, data were taken randomly. By introducing periodic data system, it may help the situation in better way.

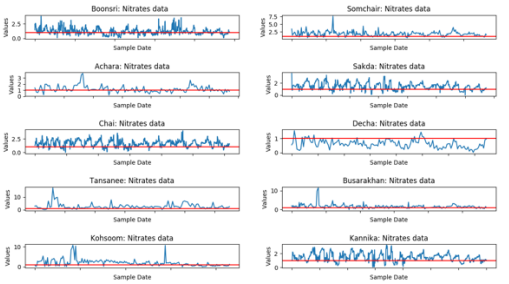
Q3) **After reviewing the data, do any of your findings cause particular concern for the Pipit or other wildlife? Would you suggest any changes in the sampling strategy to better understand the waterways situation in the Preserve? Your submission for this question should contain no more than 6 images and 500 words.**

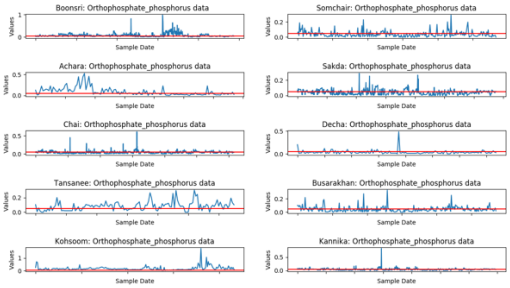
The water pipit feeds on a wide range of invertebrates and snails. If the preserve water affects with chemical contamination, the wild life including invertebrates and snails will endanger as well. Based on several criteria, we can measure the quality of the water such as water temperature, dissolved oxygen, Biochemical oxygen and Orthophosphate-phosphorus, Ammonium and Nitrates. When those indicators lie below accepted level in water, the water quality of the reserve will remain safe for Pipit or other wild life.











Water temperature and dissolved oxygen level are in reasonable level. But other indicators are on the above the safety level. Those will definitely cause a havoc to the preserver wild life as well as Pipet birds.