Abstract 1

Using GIS Site Suitability Analysis to Study Adaptability and Evolution of Life: Locating Springs in Mantle Units of Ophiolites

GIS is a powerful tool that can be used to locate springs sourced in ophiolites. The unique features associated with these springs include a reducing subsurface environment reacting at low temperatures producing high pH, Ca-rich formation fluids with high dissolved hydrogen and methane. Because of their unique chemical characteristics, these areas are often associated with microbes and are thought to be similar to the features that enabled life to evolve on Earth. Locating and sampling these springs could offer a deeper look into Earth's deep biosphere and the history of life on Earth. Springs have traditionally been located using expensive and time-consuming field techniques. Field work can be dangerous. The goal of this study was to develop a model that could locate these unique geological features without first going into the field, thus saving time, money and reducing the risks associated with remote field localities. A GIS site suitability analysis works by overlaying existing geo-referenced data into a computer program and adding the different data sets after assigning a numerical value to the important fields. For this project, I used surface and ground water maps, geologic maps, a soil map, and a fault map for four counties in Northern California. The model has demonstrated that it is possible to use this time of model and apply it to a complex geologic area to produce a usable field map for future field work.

Abstract 2

The Citrus Solution: Phase II

The purpose of this experiment was to test the effectiveness of composite filters made from citrus peels and citrus pectin along with charcoal and sand on removing heavy metal pollutants from the waters of Tar Creek. A toxicity test was also done before and after filtration using Daphnia magna. Charcoal and sand were used as filtrates to decrease the TDS and neutralize the pH of the water after filtration. Daphnia magna were used as toxicity test before and after filtration. It was hypothesized that the composite filters (citrus + sand +charcoal) will decrease the heavy metal concentration, neutralize the pH, and decrease the TDS after filtration.

It was also hypothesized that a higher percentage of Daphnia magna will survive in the filtered water as compared to the unfiltered water.

Water samples were collected from four different sites at Tar Creek. Each water sample went through four different citrus filters plus one control (sand + charcoal). All the citrus filters decreased the heavy metal concentration after filtration. All of the filters neutralized the ph. The citrus peel filters for Site 4 were the only filters to have a pH of 7 after filtration. Only 25% of the citrus filters decreased the TDS after filtration, while 50% of the control filters decreased the TDS after filtration. A higher percentage of Daphnia magna survived after filtration. The orange peel had the overall highest survival of Daphnia after filtration. The correlation observed before and after filtration was cadmium was most toxic to Daphnia magna.