Jan 1st, 12:00 AM

09. Environmental Science

University of Central Oklahoma

Abstracts from the 2014 Oklahoma Research Day

Held at the University of Central Oklahoma

05. Mathematics and Science

09. Environmental Science

05.09.01 Enhanced Microbial Remediation of Nitrate and Perchlorate in a Simulated Aquifer Through Electrical Proton Reduction

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East Central University

Nitrate and perchlorate are increasingly becoming environmental health hazards as they contaminate groundwater through runoff and fuel leakage. This ongoing research involves developing a new way of enhancing bio-degradation through the use of electrical proton reduction to increase dissolved hydrogen levels in a simulated aquifer. A bacterial enrichment was created from lake sediments where high levels of nitrate and perchlorate occur. This enrichment is being pumped continuously through a simulated aquifer of four columns, two containing sand and two containing soil, in order to allow for colonization. The ingoing and outgoing solutions of these columns are monitored for nitrate and perchlorate levels as a known concentration of each chemical is pumped through. Simultaneously, a negative potential charge is applied to an electrode within a column of each soil type. This negatively charged electrode should provide a dissolved hydrogen source, via proton reduction, and thus a bio-oxidizable energy source which could enhance degradation. From this data, the relationship between nitrate and perchlorate levels and the addition of hydrogen through proton reduction will be determined. This research is intended to provide a cost-effective method of treating these chemicals insitu. Solar panels with wires extended into groundwater could be set up to provide an energy source. This process could be implemented in areas worldwide where financial and electrical resources are limited.

05.09.02 Denning and Nesting Sites of Neotoma cinerea by Radio Telemetry

Mary, Jordan

Langston University

The bushy-tailed woodrat (Neotoma cinerea) is a medium-sized rodent found throughout the Pacific Northwest, North Dakota, northern New Mexico and the Sierra Nevada (Carey 1991). Bushy-tailed woodrats are very important animals in the forest food-chain. They are one of the most important species in the diet of the Northern Spotted Owl (Strix occidentalis caurina). (Wilson 2013). The Northern Spotted Owl is one of the most studied bird species (Zabel 2003) and in 1990, mainly due to habitat loss, was listed as a federally threatened species (Olson 2004). Although bushy-tailed woodrats serve important ecological roles, there is relatively little information about their life history traits or habitat needs. Recently, studies have begun to increase. Several bushy-tailed woodrats were caught in traps and radio-collared for tracking. Being an aboreal species, it can be assumed that most of the bushy-tailed woodrats' den locations will be in trees, particularly conifers. Much is to be learned about their dispersal and living patterns. The more known about bushy-tailed woodrats and other small forest prey, the more is known about the Northern Spotted Owl upon which many major forest plan decisions are based on.

05.09.03 A Novel and Economical Approach to Remote Sensing of Hydroperiods in Montane Desert Aquatic Systems

Jeremy, Massengill , Paul Stone

University of Central Oklahoma

In montane desert systems, aquatic habitats exist along a size gradient ranging from small temporary pools to large intermittent tanks structured by a hypervariable system of stochastic events, environmental factors, and biotic interactions. Our study area in the Peloncillo Mountains of southwestern New Mexico is characterized by an intertwining network of canyons, seasonal monsoons and periodic drought. Understanding the biology of aquatic organisms in this system requires an understanding of the distribution and hydroperiod of aquatic habitats. We have 'snapshot' observations of water levels from periodic sampling trips over the past 20 years, but the ability to measure water levels continuously would be valuable. Existing technology requires deployment of expensive equipment which would be vulnerable to vandals if left unattended. A more economic approach is the use of temperature signals to detect changes in the hydroperiod of aquatic habitats. Temperature loggers (n=8) were set throughout the study area. At each location, one logger was placed in an area that is known to form an ephemeral pool when water is present and one logger was placed in the surrounding landscape that will not be submerged. By observing the average rate of change in the temperature signal between loggers, we measured the duration of the monsoons, winter rains and summer drought, and documented two drying events and a major flooding event that would have previously been undetected.

05.09.04 Bioremediation of Chlordane by Indigenous Actinomycetes Bacteria

Jocelyn, Bidlack , Paul Olson

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Chlordane (Octachloro-4, 7-methanohydroindane) is a complex organochloride used extensively as a broad-range insecticide through the 1980's. Although application is now prohibited, chlordane is regarded as a significant environmental problem because of its persistence in the environment, high toxicity, and tendency to bioaccumulate. Actinomycetes bacteria are promising remediation agents capable of degrading a diverse assortment of recalcitrant compounds. In this study, Actinomycetes strains were isolated from a chlordane-contaminated site and evaluated for the capacity to degrade chlordane. Isolated strains were identified to genus by morphological and biochemical characteristics and identified to species by 16s rDNA sequence analysis. Strains were subjected to a mixture of a-chlordane and g-chlordane to assess their ability to degrade the isomeric compounds either as a sole carbon source or by co-metabolism. Organic extractions were conducted over the course of 192 hours to ascertain the rate of degradation of a-chlordane and g-chlordane for each strain. Extracts were analyzed by gas chromatography mass spectrometry to determine the extent of degradation over time and the identity of the metabolic degradation products. This study functioned to document the remediative capacity of these strains thereby aiding in the concerted effort to develop cost-effective and environmentally benign approaches for the remediation of persistent contaminants in the environment.

05.09.05 Non-Occupational Noise Assessment Of Ear Pod Auditory Noise Exposure Among Southeastern Oklahoma State University Students

Chris, Bradshaw

Southeastern Oklahoma State University

This study examined auditory non-occupational noise, more specifically, sound levels experienced by students with digital audio players through inner ear style headphones referred to hereafter as ear pods. Growing popularity of digital audio players, such as iPods, mp3 players, and cell phones with play back capabilities, has become increasingly more common among young college student population. College level adults are spending more time connected to these devices, and this study seeks to determine how long and how loud they listen to music. Accompanying this trend are the sleek and fashionable ear buds which are proving to pose irreparable hearing loss as a more focused, amplified sound is forced into the inner ear. This study also asked the students of SOSU if they presently experience symptoms of hearing damage that might otherwise go unnoticed. The purpose of this study was to determine the sound level and length of time students utilized ear pod/head phone listening devices. The second aspect of the study was to determine any symptoms of hearing damage that might otherwise go unnoticed. Specifically, this study sought to accomplish the following: To determine the amount of time and type of music students spend listening through ear pod/head phone listening devices. To determine the average volume students adjusted the listening devices to during use. To determine if students