Products
Peer-reviewed publications
Conference presentations

Information Transfer Program
The project to evaluate the prevalence of antibiotic resistance genes has been reported by NWRRI Newsletter on July 1, 2019, Volume 5, Issue 3. A video documentary on water and sediment sampling from the Las Vegas Wash to identify antibiotic resistance genes has been made and disseminated by DRI via Facebook, Instagram and YouTube in August 2019 (https://www.youtube.com/watch?v=0PfrxzM6GDs).
The project, Improving Wastewater Treatment Using Biofilms That Degrade Phenolic And Aromatic Contaminants, has a provisional patent applications have been initiated with the University of Nevada Las Vegas Intellectual Property Transfer Office to protect both novelties from this project, the bioreactor design and the bisphenol A degrading bacterium. The quarterly newsletter disseminated each quarter of FY19 that spotlighted specific research projects, PIs, and students and are posted on the NWRRI website at https://www.dri.edu/nwrri/nwrri-news-and-reports/.
Student Support
A total of 11 undergraduate students, 5 master’s students and 1 high school student were supported by the annual base grant and/or matching funds.

Notable Achievements and Awards
Ahdee Zeidman, 2nd Place in the 2020 NWRA Annual Conference, Graduate Student poster competition.
Adam Clurman, 2nd Place in the 2020 NWRA Annual Conference, Undergraduate Student poster competition.
Degradation Of Emerging Contaminants In Treated Wastewater Using Immobilized Non-zero Valent Iron

Project Type: Annual Base Grant
Project ID: 2019NV167B

Project Impact:
The novel synthesized nano zero-valent iron immobilized on Santa Barbara-15 (nZVI/SBA-15) composite was tested as catalyst of peroxymonosulfate (PMS) decomposition for the degradation of different antibiotics. For example, the nZVI/SBA-15/PMS oxidation system was found highly efficient in the degradation of sulfamethoxazole (SMX). The best experimental conditions for SMX degradation were using 1g/L of nZVI/SBA-15 and 5mM of PMS which produced 90% SMX removal within the first 15 minutes of reaction. Results of experimental trials on tetracycline degradation using mild nZVI/SBA-15/PMS conditions showed a significant reduction on the biological effect of the treated effluents on bacterial communities in tests bioassays. In all the cases, kinetics studies suggest that the degradation process occurs within the first five minutes.
Evaluation Of Antibiotic Resistance Genes (ARGs) In The Urban Wetland Exosystem: Las Vegas Wash

**Project Type:** Annual Base Grant  
**Project ID:** 2019NV168B

**Project Impact:**

The study evaluated the prevalence of six antibiotic resistance genes (ARGs) corresponding to sulfamethoxazole (sul1 and sul2), ampicillin (ampC), tetracycline (tetO and tetW), and vancomycin (vanA) in the Las Vegas Wash. The results show that the gene copies of 16S rRNA and the target ARGs were much lower in the water and sediments collected in summer than winter, which may be due to greater water flow. Among the target ARGs, the most prevalent genes found were sul1, sul2, and vanA, and tetO and tetW were less detectable. For both water and sediments, the ARGs were found more prevalent in the upstream sites than the downstream sites. The results demonstrated that the prevalence of the target ARGs were affected by the sampling location and season. The results indicate that the Las Vegas Wash wetlands are an important reservoir of ARGs from receiving wastewater discharges, and ARG concentrations decrease before water flows into Lake Mead. The study also identified the antibiotic resistant bacteria in the sediments using heterotrophic plate count (HPC) method and PCR combined with Sanger Sequencing. The HPC resulted in $1.9 \times 10^5$ colony forming unit (CFU) per gram. The results showed that 54 antibiotic resistant isolates were obtained in the plates spiked with the target antibiotics, where 14 bacterial isolates were found resistant to ampicillin, 30 bacterial isolates were resistant to sulfamethoxazole, and 10 bacterial isolates were resistant to vancomycin. There were no tetracycline resistant bacteria present in the sample.
Improving Wastewater Treatment Using Biofilms That Degrade Phenolic And Aromatic Contaminants

Project Type: Annual Base Grant
Project ID: 2019NV169B

Project Impact:
A novel bioreactor design for enriching bacteria from environmental samples for species that are capable of efficient degradation of aromatic contaminants was developed. Tests resulted in the recovery of a bacterium that uses bisphenol A, which is present in thermoplastics monomer, as the sole carbon and energy source. The bacterium is a super degrader of bisphenol A, capable of eliminating saturated levels of the compound in 2-3 days.