Deposition of heavy metals and radionuclides from anthropogenic activities such as mining and industrial production may pose a high degree of toxicity within the environment. These contaminants can be stored in a plant's tissue and cause metabolic fluctuations that can induce physiological changes. That physiological change is a response to changes in chlorophyll a/b ratios which can be detected using laser-induced fluorescence (LIF) spectroscopy. LIF is a spectroscopic tool that can be used for real-time analysis of chlorophyll by observing shifts in molecular energy levels due to laser excitation that causes fluorescence as a biological response. LIF responses are captured as images using a CMOS camera in which pixels are extracted and analyzed as histograms to show the change in RGB decimal code values. These histograms demonstrate the strong correlation between changes in total chlorophyll content and metal uptake. Two laser systems with wavelengths of 445 nm and 462 nm corresponding to chlorophyll a and b absorption peaks were used, respectively. Azolla filiculoides, an aquaponic fern that is commonly used for extraction and removal of contaminants from an environment, was used as a study plant. The goal of this project was to test laser capabilities, specifically the various distances and light conditions that can be used to image plants, as well as the sensitivity of detecting plant response to different levels of heavy metals. This testing helps fine tune laser system settings and explore its capabilities to further enhance this remote sensing technique in identification and quantification of heavy metals concentrations within the environment.