Treatment of selenium in water using algal turf scrubber (ATS™) technology

By Hunter Doyle[1], Sierra Mitchell[1], Freddy Witarsa[1]

[1]Department of Physical and Environmental Sciences, Colorado Mesa University, Grand Junction, CO

The algal turf scrubber (ATS™) is a water treatment system that utilizes the natural properties of algae to "scrub" contaminated water of unwanted pollutants. The algae form naturally after water is pumped through the system for a short period of time. These systems were used in the treatment of agricultural wastewater and eutrophic water containing high amounts of nutrients (nitrogen and phosphorus) and were shown to accumulate these nutrients from the water that flows through them, improving the quality of the treated water. Some studies have also found that these systems could remove iron, magnesium, calcium, and other metals. In the western part of Colorado, specifically the lower Gunnison river basin, high levels of selenium (sometimes above the 5 µg/L water quality standards) in the water have been observed. While the use of ATS is common for removing nutrients, the ability of an ATS to remove selenium from water is largely unstudied. This study serves to address this research gap by determining the effectiveness of ATS in removing selenium from waterways that carry effluents from agricultural sites.

A pilot-scale ATS was constructed using a large aqua-tank (4' x 6' x 1') lined with a mesh screen to allow algal growth. The ATS was installed in a local irrigation return flow that have elevated levels of selenium. The system uses a solar pump to divert water from the irrigation ditch into a tipping bucket, which releases the water in pulses onto the mesh screen and subsequently back into the irrigation ditch. Successful implementation and removal of selenium by this system that relies on solar energy and algae would provide a cost-effective and efficient method for selenium treatment in the region.