



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

<b>Name(s)</b> <b>Mari O. Sanders</b>	<b>Project Number</b> <b>J1028</b>
<b>Project Title</b> <b>The Effectiveness of Cereal Crops in Riparian Restoration Design</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This project explores the role of cereal grain crops in riparian restoration design as part of a four year examination of nitrate runoff resulting from fertilizer use. Last year's project analyzed grass planted from seed compared to commercially grown sod to determine which alternative acted as a better nitrate filter. This year, the hypothesis states that cereal crops such as barley and oats will be more effective in reducing nitrate runoff compared to rye and fescue grasses.</p> <p><b>Methods/Materials</b> The hypothesis was tested by planting ryegrass, fescue, oats, and barley into troughs. Triple 15 fertilizer was added and the troughs were watered at regular intervals as the crops grew. Only one type of fertilizer was used in order to reduce the amount of variables in the study. In previous years, inorganic and organic fertilizer results were analyzed to compare nitrate levels. This year, a local accredited municipal water lab was contacted and an Ion Chromatograph was used to more accurately measure nitrate concentrations in water. Some samples required dilution to be within the calibration range of the system. By dividing the nitrate result by the dilution factor, it was determined if a water sample was in the calibration range. Samples had to be diluted and retested depending on the outcome of the initial nitrate measurement.</p> <p><b>Results</b> Cereal crops demonstrated the ability to decrease runoff from fertilizer from the first to the third test run more effectively compared to grasses. However, grasses demonstrated the overall ability to reduce nitrates in samples to a greater degree compared to baseline throughout all three samples. All plant types analyzed were found to reduce nitrates to a significant degree (over 50%) compared to baseline.</p> <p><b>Conclusions/Discussion</b> The large amount of pollutants entering waterways has had catastrophic effects on water quality, marine life, and human health. Adding to the problem is the fact that seventy to ninety percent of the riparian forests throughout the nation have been destroyed over the last 150 years. Riparian systems filter toxins in the environment. According to this study, cereal crops can be used as bank stabilizers to reduce erosion in riparian design due to their deep root systems, while also absorbing nitrates. Furthermore, cereal grains can be planted as cover crops in the off-season to reduce nitrate runoff before the toxins reach traditional riparian zones.</p>	
<b>Summary Statement</b> Cereal crops and grasses were compared and both were shown to significantly reduce nitrate runoff from fertilizer use, as part of riparian restoration design.	
<b>Help Received</b> I grew the test plants, applied fertilizer, and collected the water samples myself. I contacted the City of Porterville Water Lab and was assisted in using an Ion Chromatograph by the staff chemist Michael Cotton. He provided help in diluting and calibrating the water samples for the Ion Chromatograph.	