



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Steven H. Cao	Project Number S1104
Project Title The Effect of Alum on Phosphate in Water and Its Effectiveness as a Solution to Northern Mexican Gulf Hypoxia	
Abstract Objectives/Goals My objective was to determine the effect of dry aluminum sulfate (alum) on phosphate levels in water from P ₂ O ₅ , or rock phosphate, fertilizer and then to use the experiment's data along with data from the NOAA on the Mexican Gulf dead zone to determine whether or not alum was an effective solution to Northern Mexican Gulf hypoxia. Methods/Materials I added phosphorus fertilizer to water and used the test kit to figure out the concentration. I then adjusted the solution to get it to the desired concentration. Then, I poured some of the solution into different beakers and added different amounts of aluminum sulfate to each beaker, and after stirring well and waiting ten minutes, I recorded the amount of phosphorus that was in the beaker after the alum was added. Then, I repeated this for different concentrations of phosphorus. Finally, I created a graph out of the data and used it and Mexican Gulf dead zone data to find how much alum would be needed to reduce phosphorus concentrations in the dead zone to pre-dead zone levels. Results I found that alum had no effect on phosphate levels in water. Conclusions/Discussion This contradicts my hypothesis and shows that alum is not an effective solution to dead zones. This could have happened because the predicted product, Al ₂ (HPO ₄) ₃ , was still soluble and could still be picked up by the phosphate testing kit. It is also possible that the fertilizer that I used had a form of phosphorus that specifically did not react with alum. Phosphorus in lakes and wastewater come from many different sources, including fertilizer, industrial dumping, and natural sources, so alum most likely works with other forms of phosphate but not P ₂ O ₅ fertilizer. This experiment shows that alum is not reliable in lowering phosphate levels. Not being able to bind with rock phosphate fertilizer would make alum an ineffective solution.	
Summary Statement My project is about the effectiveness of aluminum sulfate as a solution to high phosphate levels and the hypoxia it causes in the Northern Mexican Gulf.	
Help Received Mr. Spenner gave advice on information to include in the board; Dr. Blickenstaff helped in finding and deciding on materials and also supervised me during experiments; Mr. Korin listened to my presentation and looked at my board and helped me revise them; Dr. Koodanjeri answered my chemistry questions,	