



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) David W. Pickart-Jain	Project Number J1925
Project Title The Effect of Nitrogen and Phosphorus on Competition between a Non-native and a Native Dune Plant	
Abstract Objectives/Goals This study was designed to test whether the invasive plant ripgut brome (<i>Bromus diandrus</i>) has a competitive advantage over the native dune plant beach buckwheat (<i>Eriogonum latifolium</i>). In addition the study will test how the outcome of this competition is affected by elevated levels of nitrogen and phosphorus. I chose these two nutrients to test because invasive <i>Bromus</i> tends to grow where another invasive species, yellow bush lupine (<i>Lupinus arboreus</i>) has previously grown. This lupine elevates nitrogen levels in the soil. I chose phosphorous because it is very limiting in the dunes. Methods/Materials I collected seedlings of <i>Bromus</i> and <i>Eriogonum</i> from the dunes at Humboldt Bay National Wildlife Refuge, and (after measuring their height) planted them in flats at different ratios of <i>Bromus</i> : <i>Eriogonum</i> (0:1, 1:1, and 2:1). I watered them with different fertilizer solutions (no fertilizer, nitrogen, phosphorous, and nitrogen+phosphorous). After 6 weeks I remeasured the plants and calculated the average amount of growth. Results <i>Eriogonum</i> , in the absence of <i>Bromus</i> , grew the most in the nitrogen and control groups. When the two species were planted together <i>Bromus</i> always did better than <i>Eriogonum</i> . The nitrogen and phosphorus treatments separately gave a greater competitive advantage to <i>Bromus</i> than the control or nitrogen+phosphorus treatments. In the 2:1 ratio <i>Bromus</i> did not do as well as it did in the 1:1 ratio. Conclusions/Discussion This experiment demonstrates that invasive <i>Bromus</i> outcompetes native <i>Eriogonum</i> in conditions that imitate nature, possibly because <i>Bromus</i> germinates before most California native, perennial, dune plants. <i>Bromus</i> grew less in the 2:1 ratio than in the 1:1 ratio, possibly due to increased intraspecific competition. In addition, the experiment supports the concept that elevated nitrogen and phosphorus levels make <i>Bromus</i> even more competitive. This explains why, in nature, the nonnative <i>Bromus</i> can outcompete native dune plants such as <i>Eriogonum</i> , especially if yellow bush lupine leaves behind elevated nitrogen when it dies or is removed.	
Summary Statement My project tested whether non-native <i>Bromus diandrus</i> outcompetes native <i>Eriogonum latifolium</i> with and without added fertilizer.	
Help Received My mom helped me with typing and with my project idea.	