



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

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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 (*Bromus diandrus*) has a competitive advantage over the native dune plant beach buckwheat (*Eriogonum latifolium*). 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 *Bromus* tends to grow where another invasive species, yellow bush lupine (*Lupinus arboreus*) 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 *Bromus* and *Eriogonum* from the dunes at Humboldt Bay National Wildlife Refuge, and (after measuring their height) planted them in flats at different ratios of *Bromus*:*Eriogonum* (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
Eriogonum, in the absence of *Bromus*, grew the most in the nitrogen and control groups. When the two species were planted together *Bromus* always did better than *Eriogonum*. The nitrogen and phosphorus treatments separately gave a greater competitive advantage to *Bromus* than the control or nitrogen+phosphorus treatments. In the 2:1 ratio *Bromus* did not do as well as it did in the 1:1 ratio.

Conclusions/Discussion
This experiment demonstrates that invasive *Bromus* outcompetes native *Eriogonum* in conditions that imitate nature, possibly because *Bromus* germinates before most California native, perennial, dune plants. *Bromus* 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 *Bromus* even more competitive. This explains why, in nature, the nonnative *Bromus* can outcompete native dune plants such as *Eriogonum*, especially if yellow bush lupine leaves behind elevated nitrogen when it dies or is removed.

Summary Statement
My project tested whether non-native *Bromus diandrus* outcompetes native *Eriogonum latifolium* with and without added fertilizer.

Help Received
My mom helped me with typing and with my project idea.