



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> Astasia S. Myers	<b>Project Number</b> <b>S1615</b>
<b>Project Title</b> <b>Impact of Elevated CO(2) Atmosphere on Germination of Jasper Ridge Plants</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> One component of Global Warming is the influence of green house gasses such as CO<sub>2</sub>. In order to better understand the potential effect on flora, I evaluated the impact of elevated CO<sub>2</sub> on the germination of native California plants to assess their capacity to adapt to increasing concentrations of atmospheric CO<sub>2</sub>.</p> <p><b>Methods/Materials</b> 19 species (17 Jasper Ridge indigenous, 1 invader, 1 control) were tested in 6 greenhouse-based ecosystems alternating 3 elevated CO<sub>2</sub> (700ppm) and 3 ambient air (350ppm). 450 chambers/flat/ecosystem were planted with 36 seeds/species/flat. 3 replicates were completed. Germination date, total germination, average germination/day, 50% germination day, and germination peak were determined. Mean, standard deviation, standard error and T-test to 5% were calculated.</p> <p><b>Results</b> All 9 species that tested to 5% error demonstrated a change in germination pattern in elevated CO<sub>2</sub>. 4 species, <i>Avena fatua</i>, <i>Bromus diandrus</i>, <i>Elymus glaucus</i>, and <i>Nassella pulchra</i>, germinated more plants and 5 species, <i>Bromus hordeaceus</i>, <i>Lolium multiflorum</i>, <i>Arabidopsis thaliana</i>, <i>Brachypodium distachyon</i>, and <i>Vulpia bromoides</i>, germinated fewer plants. Additionally, 3 species, <i>Elymus glaucus</i>, <i>Nassella pulchra</i>, and <i>Arabidopsis thaliana</i> germinated at a statistically significantly slower rate in elevated CO<sub>2</sub> than their ambient air counterparts.</p> <p><b>Conclusions/Discussion</b> Atmospheric concentrations of CO<sub>2</sub> are expected to rise significantly, potentially doubling, in the next 50 years. Studying CO<sub>2</sub>'s effect on the ecosystem is crucial to understanding the environment's future. As there are feedbacks between the plant-soil system and the atmosphere, knowing how plants respond to the atmosphere tells us something about how the atmosphere, and associated factors like rainfall and temperature, will appear in the future. Additionally, as plants are the base of the food chain, changes in plant growth could also translate to alterations in organisms at other tropic levels. Elevated CO<sub>2</sub> does appear to impact the germination of native California plants. The specific effect on growth quantity and rate was unique to each species tested. These results suggest that elevated atmospheric CO<sub>2</sub> could cause changes in native California flora communities by modifying each species' competitive germination advantage or disadvantage. Should this be the case, the effects of elevated CO<sub>2</sub> on vegetation could be an important concern of Global Warming.</p>	
<b>Summary Statement</b> The project's purpose was to study if CO <sub>2</sub> , a component of Global Warming, will affect the germination of native Californian plants.	
<b>Help Received</b> Stanford Global Ecology Department Director Dr. Chris Field, who mentored; Dr. Nona Chiariello for useful advice; Mr. Todd Tobeck for help with project design and construction; Dr. Sue Thayer introduced me to Stanford research; Dr. Noel Gurwick for help with analysis	