# CALIFORNIA STATE SCIENCE FAIR
# 2010 PROJECT SUMMARY

**Name(s)**
W. Brock Oury

**Project Number**
**J2022**

**Project Title**
## Coastal Pines: Ability of Needles to Condense Moisture

**Abstract**

**Objectives/Goals**
The Torrey Pine (Pinus torreyana) is able to condense water from coastal fog with such effectiveness that it is able to supplement San Diego's coastal annual rainfall in order to survive in this typically arid climate. I hypothesized this was not just due to salt nucleation sites or needle length helping to condense water, but was also due to some advantage in the microscopic structure of the Torrey Pine needle that increased the surface area of the needle. I hypothesized that the surface area of each Torrey Pine needle was greater than that of the Canary Island Pine (Pinus canariensis), Aleppo Pine (Pinus halepensis), or the Japanese Black Pine (Pinus thunbergiana), and this allows the Torrey Pine to be more efficient at collecting and condensing water from the air.

**Methods/Materials**
I constructed a fog chamber using two humidifiers. I monitored the humidity using a hygrometer. I tested and compared the same weights of needle samples in each of five trials. I measured the water precisely and graphed five trials of data that compared the four species. I recorded how much condensation was produced, the hourly rate at which the water condensed, and the percent of efficiency to condense the fog. I examined the needless of the four test species under a 60x microscope and photographed the images. I also photographed cross sections. All of the needles were collected from the trees at the same location more than three miles from the coast. No needle type had any salt advantage.

**Results**
From the results of the 20 tests, the Torrey Pine was the most effective species at condensing the humid air and was significantly more effective at collecting water than the next most effective species, the Aleppo Pine. The Torrey Pine also appeared to have a greater density of microscopic projections along its needles than the other three needle types. The Torrey Pine needle projections appeared to be more prominent and larger than the projections in the other species.

**Conclusions/Discussion**
It appears the Torrey Pine may have unique adaptations which successfully help turn the fog of the San Diego coast into condensed water, creating #rain# for the root system. Based upon the findings, I would recommend further study of these microscopic features of the Torrey Pine needles to discover how the features might relate to the efficiency of condensation.

**Summary Statement**
I compared the effectiveness of the Torrey Pine needles versus other needles to condense fog and examined the needles at 60x to look for microscopic structural differences that might provide advantages for the needles.

**Help Received**
I would like to thank my science teacher for providing guidance and helping me with the Intel microscope. I would also like to thank my grandfather for helping me get my needle samples, for monitoring me throughout my project, and for helping me do the cross sections of the needles safely.