

Growth of Coyote Brush and Purple Needle Grass at a Santa Rosa Island Restoration Site




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Introduction

- There are eight Channel Islands off the coast of California. Santa Rosa is the second-largest of the four northern islands. It has no native grazing mammals.
- In 1820 the Spanish removed the native Chumash people. Introduced livestock and other ungulates overgrazed the land and eroded the soil.
- Today non-native mammals have been eliminated from the islands and the vegetation is recovering, but slowly where growing conditions are worse.
- On the main ridge, restoration vegetation includes planted coyote brush (*Baccharis pilularis*, BAPI) and purple needle grass (*Stipa pulchra*, STPU) in experimental plots with different treatments. Our study compares survival and growth among the treatments after one year.

Restoration Treatments

| Control (C) | Wattle (W) | Fog Fence (F) |
|--|---|---|
| The control received supplemental irrigation. While not a true control, the plants would likely not establish otherwise. | This treatment had supplemental irrigation and erosion-control Wattles made of jute fabric and coconut fiber. | This treatment had supplemental irrigation, wattles, and fog-capturing fences made of 2 foot-tall 12-gauge wire mesh and 40% shade cloth. |
|  |  |  |

Methods

BAPI and STPU were planted in 2016 and initial measurements were taken. In 2017, surviving plants were measured again. Plant height, stem diameter, and canopy dimensions were measured for BAPI. Plant height was measured for STPU. Height and canopy were measured to 0.5 centimeter. Stem diameter was measured to 0.01 millimeter.

Height was measured from the base of the plant to the tip of the longest BAPI stem and STPU blade or culm. BAPI stem (s) diameter was measured where it emerged from the soil. In the case of multiple stems, the calculation $\sqrt{(s_1^2 + s_2^2 + \dots + s_n^2)}$ was used to estimate effective stem diameter. BAPI canopy dimensions were measured as the longest length viewed from above and the longest width perpendicular to the length. These dimensions were multiplied to represent area for canopy.

The difference between years was compared for all measurements except canopy area (CA). The CA of surviving BAPI was divided by the 2016 CA to determine a ratio of increase.

Results

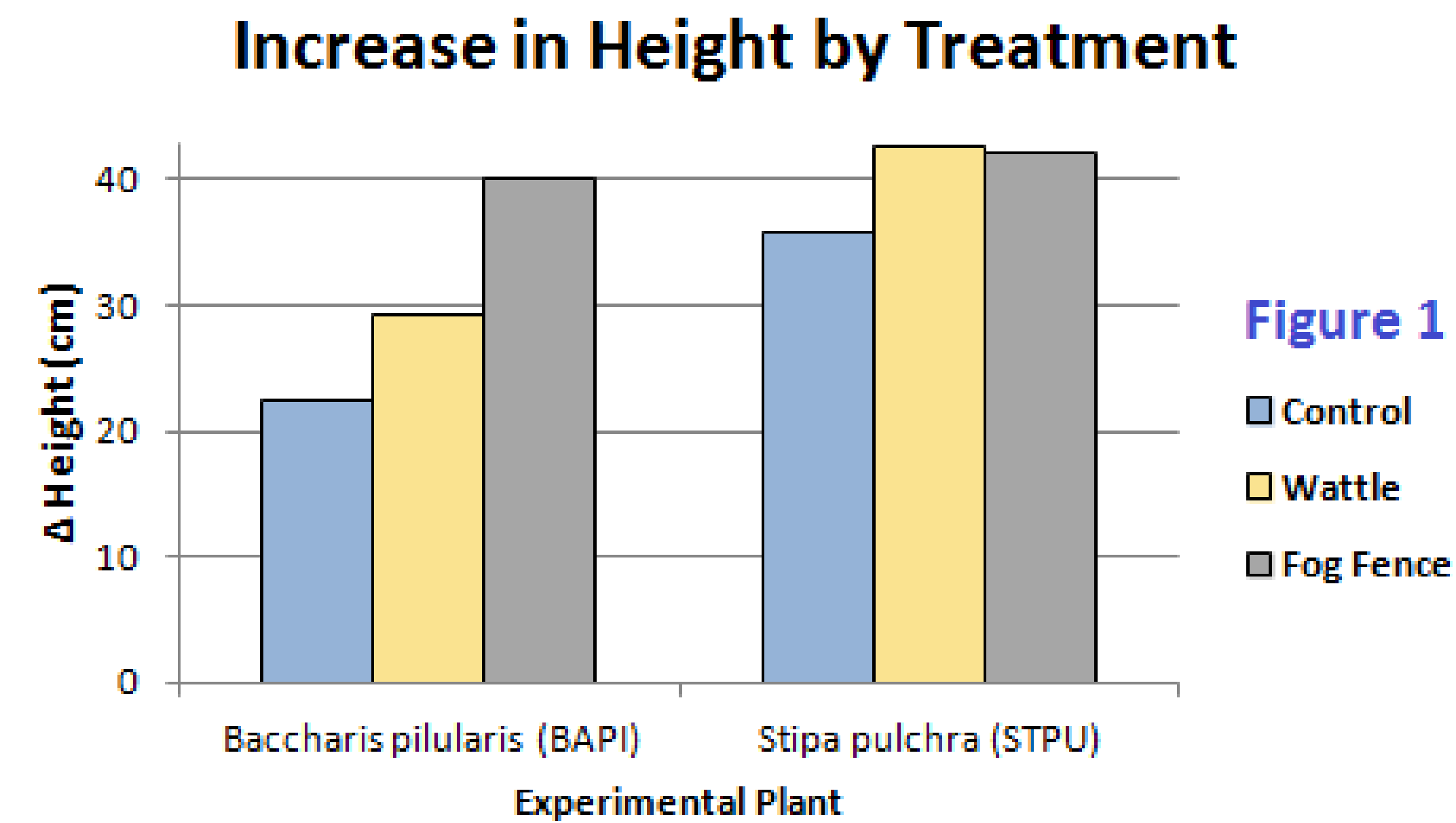


Figure 1: The increase in height shows a positive trend for BAPI with each additional restoration element. The increase in height for STPU is also positive, but slightly less for the F treatment compared to the W treatment.

Figure 2: The majority of BAPI survived all treatments. The survival of STPU varied by treatment.

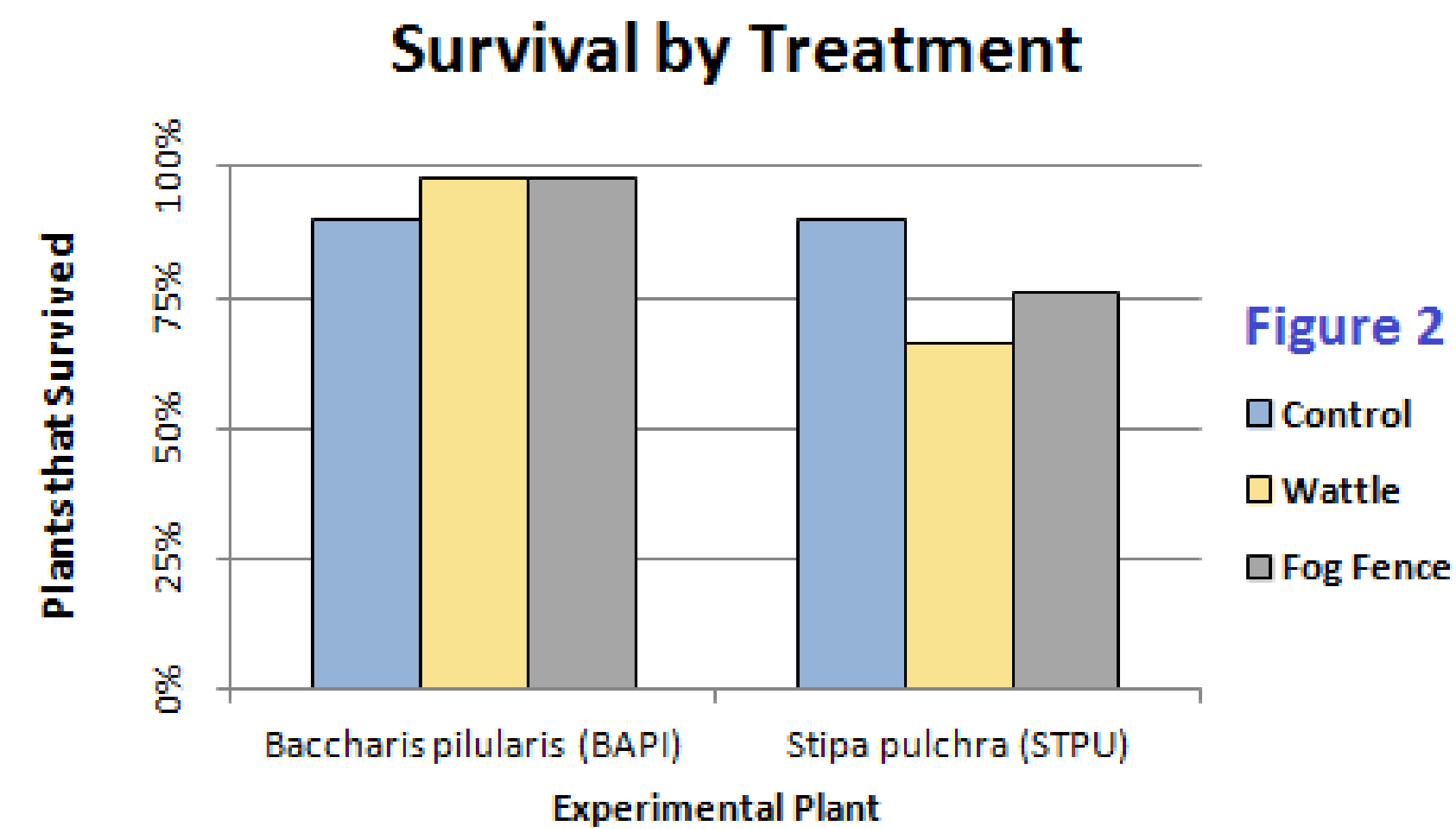


Table 1: The increases in BAPI stem diameter and canopy area followed a similar trend as that of height, and so are not graphed. The numbers are included below.

| Δ BAPI Measurement | C | W | F |
|-------------------------------|-----|------|------|
| Stem Diameter (mm) | 5.6 | 6.5 | 7.6 |
| Canopy Area Ratio of Increase | 9.8 | 13.8 | 16.0 |

Discussion

For all measurements, surviving BAPI do best in the F treatment. STPU survivor height measurements indicate STPU do just as well in the W treatment as compared to the F treatment, but overall survivorship is better in the C treatment. This suggests that BAPI restoration should include fog fences, but restoration of STPU may not require additional measures beyond irrigation only.

BAPI is a perennial evergreen shrub, so any increases in aboveground plant measurements may very well indicate increases in belowground root mass which would improve soil retention and overall restoration of the main ridge. STPU is a summer/drought-dormant bunchgrass, and also a perennial. As such, surviving STPU root mass would also help counter the erosion caused by the previously introduced mammals.

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