Data Explorer Info: Drought effects on tree survival and growth

**Title**

Drought effects on tree survival and growth

**Summary**

This data set was compiled from worldwide data to examine the effects of drought on trees.

**Introduction**

This data set was compiled from worldwide data to examine the effects of drought on trees. Included in the dataset are measurements of growth and mortality as they relate to the size category of trees sampled.

Trees are a vital component to life on the planet due to the ecosystem services they provide, including oxygen production and carbon sequestration. Despite their low abundance, larger trees can have greater impact in the forest than smaller trees (e.g. by changing the microclimate around themselves by providing shade and reduced temperatures). As such, large trees play a keystone role in the forests they inhabit.

Trees are immensely dependent on their abiotic environment with tree/forest types inhabiting specific climatic conditions as dictated by temperature and precipitation. As a result, when sessile species like plants experience changes to the environment, particularly long-term changes, they have to either adapt to the new conditions or risk death. Therefore, to protect the world’s forests, it is important to identify environmental factors that lead to increased tree mortality. Bennett et al. (2015) examined the influence of drought on mortality and growth rate for different sizes of trees by compiling data from previously published research. They also included data on bark beetles infestation to determine if insect pests can exacerbate the consequences of drought. These data can be further interpreted in light of climate change since drought conditions are predicted to increase in some geographic locations. Any shifts in climatic conditions could have major implications for the world’s forests, and the benefits they provide.

**About the data**

This data set is a meta-analysis from 40 different drought events, represented as different colors on the map, that occurred in forests from around the world (Fig 1). Forest types varied from semi-arid woodlands to tropical rainforests. The categories of tree size were based on the diameter at breast height (DBH), a common measurement of tree size, and is determined by measuring the circumference of a tree approximately 4.5 feet from the base and then converting it to the diameter.



Figure 1. Drought locations used in the data set. Colors correspond to unique drought events (from Bennett et al. (2015) Supplementary information). Shapes (triangles, circles, and squares) represent the data reported from published studies on that drought event. Triangles reported diameter growth rate, circles reported mortality rate, and squares reported percent mortality. Not all locations were used in this exercise so the numbers do not correspond with the data set provided.

The data set contains the following columns:

|  |  |
| --- | --- |
| **Location** | Identification number for location where data was collected |
| **Tree size category** | Measured in cm, each number represents a range (1 = 1-9.9, 10 = 10-19.9, 20 = 20-29.9, 30 = 30-39.9, 40 = 40-49.9, 50 = any DBH over 50) |
| **Mortality** | Measured as a percent of the tree population |
| **Growth rate** | Ratio of diameter growth rate under control conditions to diameter growth rate under drought conditions, measured in mm |
| **Bark Beetle** | “1” means present, “0” means absent |

**Related activity**

You can use this data set to explore the impact of drought on different sized trees by examining percent mortality and growth rate in the activity “Is bigger always better? An investigation on the effect of drought on different sizes of trees.” This activity gives students the opportunity to visualize, analyze, and interpret authentic scientific data.

**References**

Bennett, A.C., McDowell, N.G., Allen, C.D., Anderson-Teixeira, K.J. 2015. Larger trees suffer most during drought in forests worldwide. *Nature Plants.*

Bennett AC, McDowell NG, Allen CD, Anderson-Teixeira KJ Data from: Larger trees suffer most during drought in forests worldwide. Dryad Digital Repository. http://dx.doi.org/10.5061/dryad.2v8p8

**Credits**

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Figure 1: “Drought locations used in the data set” by Bennett et al. (2015) Supplementary information