# Methods

## Model Description

The model simulates a cohort of trees for a given mean annual rainfall (MAR). The trees grow annually as a function of MAR ({Higgins:2000up, Shackleton:ua}). This rainfall is sampled from a range within the 95% confidence interval of the modeled bivariate relationship between mean fire return interval and MAR at Kruger National Park . Each year, the occurrence of a fire is calculated by sampling from a binomial distribution with a probability equal to the inverse of the sampled mean fire return interval (i.e., the fire frequency (fires yr-1)). If a fire occurs, the intensity of the fire is calculated as a function of MAR following Govender et al. (2006). Probability of topkill was calculated as a function of height and intensity {Higgins:2012fc}

## Growth rates

## Mean Fire Return Interval and MAR

Gridded mean annual rainfall from worldclim was overlaid across the rasterized mean fire return interval (MFRI) for Kruger National Park, South Africa {WorldClimversion:2005tr} **CITE SMIT**. Smit et al. (**year)** mapped fire extents from a **n** year period at Kruger National Park to calculate mean fire return interval. We modeled MFRI as a function of MAR by fitting a generalized linear model (glm) with a gamma distribution and a log link function. We compared this to a null model (MFRI ~ 1) and selected based on Akaike Information Critereon as well as analyses of model suitably plots (cite AIC). We calculated the 95% confidence interval of the relationship between MFRI and MAR and sampled within this space for values relating this bivariate relationship.

## Fire intensity and MAR

After analyzing the results of the ongoing Kruger National Park experimental burn program, Govender et al. (2006) found a positive relationship between MAR and Byram’s fireline intensity. Fire intensity was calculated from a 50 year dataset from Kruger National Park’s Experimental Burn Plots.

## Probability of Topkill