



In Partial Fulfillment of the Requirements for the Degree of

## **Master of Science**

### **Svenja Wagner**

Will defend her thesis

### **Effects of Water Holding Capacity and Precipitation on Above Ground Net Primary Production**

#### **Abstract**

Aboveground net primary production (ANPP) is an important ecosystem process that, in drylands, is most frequently limited by water availability. Water availability for plants is in part controlled by the water holding capacity of soils. Available water holding capacity (AWHC) of soils is strongly influenced by soil texture and depth. This study drew upon localized rain gauge data and four data-sets of cover-line and biomass data to estimate ANPP and to determine annual precipitation (PPT). I measured soil depth and texture by layer of 112 plots across the four landscape units for which estimation of ANPP were available. A pedotransfer function was used to estimate AWHC from soil depth measurements and texture analysis. These data were analyzed using simple and multivariate regression to test the effect of annual precipitation and available water holding capacity on aboveground net primary production. Soil texture remained constant among all plots (sandy loam) and depth to caliche varied from 15.16 cm to 189 cm. AWHC and the interaction term (PPT\*AWHC) were insignificant ( $p=0.142$ ,  $p=0.83843$ ) and annual PPT accounted for 18.4% of the variation in ANPP. The relationship between annual PPT and ANPP was stronger where soils had an AWHC > 3 cm ( $R^2=0.25$ ) and weaker where soils had an AWHC <3 cm ( $R^2=0.11$ ). Shrub ANPP was insensitive to precipitation regardless of AWHC ( $R^2=-0.012$ ,  $R^2=0.014$ ). Results from this study indicate that a model incorporating annual PPT and AWHC may not serve as a good predictor for ANPP at a site level where there is little variation in soil texture.

Wednesday, April 10, 2019  
2:00 PM  
Wrigley Hall, Room 102

Faculty, students, and the general public are invited.

Supervisory Committee:  
Dr. Osvaldo Sala, Chair  
Dr. Arianne Cease  
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