Pine pine (Pinus edulis) woodlands occupy 17 to 27 million hectares across North America. Because of low timber value this forest type has not been as extensively researched as many other more profitable forest types. dendrochonology has been used for historical reconstruction of tree stands, fire regimes, and climate using pine pine tree rings (http://www.confiers.org жизниPinus edulis.php). Combining low cost approaches of common stand exams and increment boring, pine pine tree rings were sampled across north-central New Mexico to study intraspecific competition amongst pinon pine in pine pine woodlands. Human interference in natural fire regimes have created artificially dense woodlands, increasing competition for available resources. Utilizing data gathered crown class, diameter at root collar (DRC), age, and average growth in DRC, a framework for resource competition for each individual tree is established to understand how these stand characteristics impact tree growth and development. Preliminary data gathered last summer showed a strong relationship between tree height, DRC, and age of the tree (Lopez & Gallegos, 2017). Data shows there is a need for more samples within the dominant crown class and there is a general trend within the box plots and averages. As you decrease in crown class you also decrease in DRC size and tree age. However, as you increase in crown class you increase in average growth in DRC. Further sampling will further refine the exact impact of intraspecific competition amongst pinon pine trees.

Methodology
Research was conducted by randomly selecting plots within five different pinon woodlands. The center of a 1/10 of an acre plot was marked. Trees that were within the plot were flagged for measurement. Coordinates were also acquired for each plot, along with the date and time of the study. Tree height, basal area, diameter of root collar, mistletoe rating, canopy cover, crown ratio, crown base height, and a tree core samples were taken within the plots. Samples collected in summer 2016 were combined with samples gathered in summer of 2017. Tree core samples were taken from living pinon and ponderosa pine trees only. All other trees were excluded. Tree cores were mounted for preservation and to accurately count age. Tree core samples were aged by using low magnifying microscopes to count tree rings. Each sample was counted and recorded on a data sheet with the age of each tree. Crown class if broken down Crown Class was compared to age of tree, DRC and average growth rate. Average growth rate was determined by dividing the DRC by the age of the tree. The box plots were used to assess general trends. Further statistical analysis will determine if there is a difference between each category.

Results

Intraspecific Competition of Pinus edulis (Piñon Pine) In Woodland Stands of North Central New Mexico Caitlin Ortega, & Joaquin Gallegos, Environmental Science Northern New Mexico College, Española, NM

Abstract

Pinus edulis (Piñon Pine) is the state tree of New Mexico and is not only culturally, but also ecologically important. Pinon pine occupies the elevations between 6,000 and 8,500 feet. These elevations in New Mexico are critical for preventing erosion, providing for wildlife, and overall health of the environment. Historical suppression of natural fire has interrupted the removal of fuels and mortality of seedling and saplings. On account of this, a very dense woodland has resulted in less competition between pinion pine trees very poorly understood. Many reports of a rise in tree mortality are related to, or because of a spike in temperatures, an increase in tree drought stress and also the populations of tree pests and pathogens (Allen et al., 2010). The drought experiment done by Sanna Seller (Los Alamos National Laboratory, NM, USA) subjected transplanted pinon trees to shading while well-watered, drought, and control treatments to see how detrimental the effects were to the trees. However, more studies are being conducted on the pinon trees that will better help us to understand and produce more suitable forest management plans. Looking at the bigger picture, when pinon trees are being affected it also has a lasting effect on everything around them. (Trotter et al. 2008) explains how the pinon trees support a large and very diverse community of arthropods that have a negative response to abiotic stress. This can impact the environment as a whole very negatively and completely disturb the ecological balance. Overall, all of this data can further help to understand the lasting effects of intraspecific competition and the role it plays in the pinon pine community.

Discussion

Pion is a long-standing tree that is most common in the Southwestern United States. It takes up to 250 years for this tree to fully mature and depending on the area it is located, mature pion tree height ranges anywhere from 5 to 30 feet. Pion trees located in Northern New Mexico are generally less than 30 feet tall. On the graph on the relationship between Crown Class and Age, it makes sense that the co-dominant trees would be older than the trees in the overtopped class because there is approximately a 200-year age difference between the co-dominant and overtopped class. Due to their age, the co-dominant class also has a wider DRC than those in the other classes. The graph on Crown Class and Average Growth Rate shows the overtopped class having a greater growth rate and the reasoning for this is the saplings grow rapidly in height to outcompete any surrounding vegetation to obtain more nutrients, sunlight, water, space, etc. The data on dominant class is not conclusive because there were not enough samples to justify their growth rates and the relationship with their age. In addition, this data can also be used to correlate the arthropod diversity and the effects the insects have on the growth rate, DRC sizes and overall health of the tree. This in turn can show the effects on the arthropod community and how not only the foliage quality but also the quantity contributes to the arthropod structure (Stone et al. 2010).

Conclusion & Implications

In conclusion, the pinion pine stands are becoming overcrowded due to the suppression of fire as well as an increase in drought which in turn, fuels intraspecific competition. The competition then becomes an issue for not only for the single tree but the whole stand. Pinion pine occurs on many sites where the arid soils are very erosive and poor tree stand health can result in loss of soil and decreases in water quality within the watershed. Mother factors are involved such as arthropods, then it becomes complicated when you are dealing with the overall health of an environment. With evidence of increased temperatures and prolonged drought, the hope is further study will increase understanding how increases in drought, changes the effects of intraspecific competition and how this in turn impacts growth rate of pion in north central New Mexico. Future sampling will attempt to gain more samples from dominant trees. Further sampling in this crown class can verify current patterns evident in the presented data. Once this data is collected the hope is to further refine basal area and tree density requirements for restoration efforts that will improve individual tree health. This data will eventually assist land managers to develop restoration plans for this species, creating resilient forests to future disturbance.

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Literature Cited