

Southern Foresters' Climate Observations: State Comparisons and Spatial Trends

Rachel Greene, Mark Megalos, William Hubbard, Leslie Bobby, and Hilary Morris

Executive Summary

We surveyed professional foresters in the southern United States to identify how frequently they observe sixteen climate variables related to forest management and how those responses vary across the South. We found that in their lifetimes, southern foresters have noticed an overall change in climate, longer dry periods and/or drought conditions, greater frequency and/or severity of invasive plant infestations, warmer winters, and hotter summers with higher frequency than other variables. Observations of climatic change are generally observed with the highest frequency by foresters from Oklahoma, Florida, and Kentucky, and lowest frequency by foresters from Mississippi and Alabama. These findings can inform Extension programming and facilitate development of materials tailored to address the observations and concerns of foresters on a state-by-state basis.

Introduction

Climate change beliefs and concerns vary dramatically across the American public, spanning a spectrum from alarmed to dismissive attitudes (Leiserowitz, Maibach, Roser-Renouf, & Hmielowski, 2012). Although the public's perceptions of climate change are well-documented, few studies focus on the beliefs and perceptions of agriculture and natural resource professionals, landowners, and other key groups. Pine Integrated Network: Education, Mitigation, and Adaptation Project (PINEMAP) is leading a coordinated, region-wide effort to describe climate change perceptions of natural resource professionals to identify needs of foresters and landowners to mitigate and employ adaptive pine management for current and future climate variability. We used 2014 survey results of southern foresters to evaluate the extent to which foresters are observing climate change and their spatial variance across the South.

Methods

In January of 2013, PINEMAP collaborators surveyed foresters in 13 southern states about observations of overall changes in climate and 16 climate variables related to forest management (e.g., drought, fire, wetter planting; Bobby et al. 2013). We measured responses with a five-point Likert scale ranging from 1 (never observe change) to 5 (very frequently observe change). Foresters were classified as single-state ($n=674$) or multi-state ($n=184$), and we calculated mean responses to each question based on state. We used an Analysis of Variance (ANOVA) with Tukey's HSD correction for multiple comparisons to evaluate differences in observations between states. We used spatial autocorrelation methods (Moran's I and Geary's c) to evaluate the tendency of observations to be similar among neighboring states.

Results & Conclusions

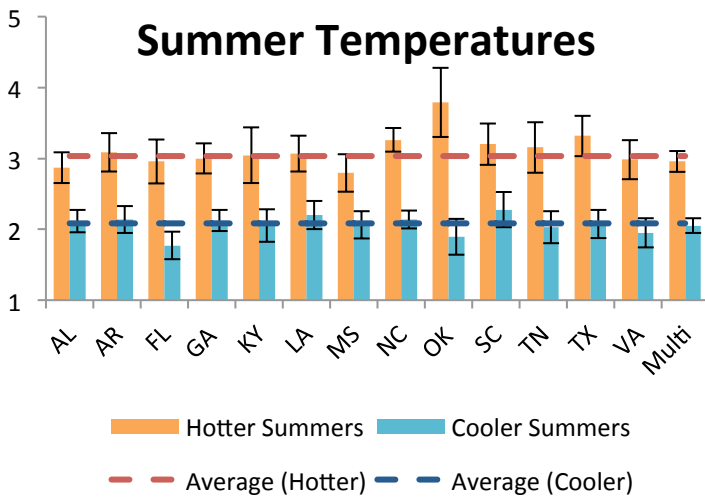
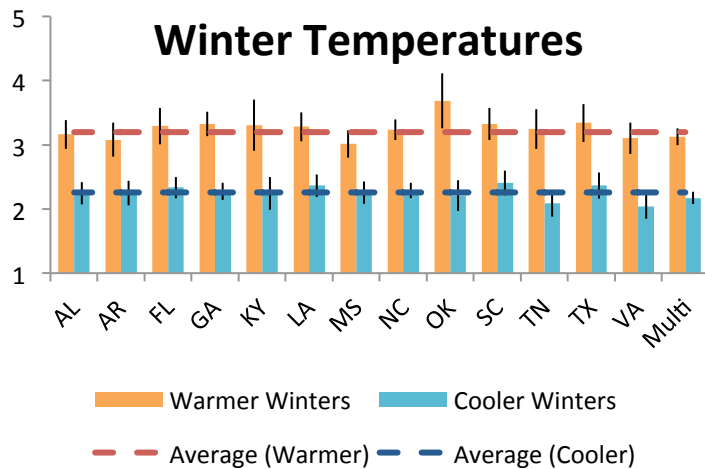
Southern foresters report occasional to frequent observations of change in climate, longer dry periods or drought conditions, greater frequency and/or severity of invasive plant infestation, warmer winters, and hotter summers over their lifetimes. Foresters report observing warmer seasonal temperatures, yet no

single state reported observing cooler seasonal temperatures (Fig. 1 & 2). Observations of greater frequency and/or severity of fire events were fairly low on average, but were observed frequently (=4) in a few states.

Foresters from Oklahoma, Texas, Kentucky, Florida, and North Carolina consistently have higher mean responses than foresters from the South's center (e.g., Mississippi and Alabama). Most states had a high mean response to at least one variable.

Forester responses are positively correlated among southern states for four variables: drought, drier planting, invasive plant infestations, and fire. States with the highest mean response to fire (i.e., Texas and Oklahoma) also report observing occasional to frequent increases of drought and drier planting.

Several factors may be driving foresters' reports of climate change and spatial correlation including the lack of local climate change, skepticism of climate change science, cultural, identity, politicization of climate issues, and reporter bias. Education and outreach programs will need different tactics to reach states with low and high mean responses. Morris et al. (in review) found that foresters who accept climate change are more likely to observe it and believe that climate change will require different management strategies. Therefore, states with high mean responses have foresters likely receptive to an explicit climate change message. Regardless of climate change acceptance, education and outreach can promote adaptive management by addressing the particular variables that foresters in each state report observing.



Figures 1 and 2. Means and confidence intervals for single-state and multi-state southern foresters reporting the frequency with which they observe warmer winters ($F=1.19$, $p=0.2842$), cooler winters ($F=1.29$, $p=0.2100$), hotter summers ($F=2.24$, $p=0.0070$), and cooler summers ($F=1.46$, $p=0.1277$). Responses were measured with a 5-point Likert scale that ranges from strongly disagree (1) to strongly agree (5). Red and blue dashed lines indicate average responses for all Southern foresters.

References

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Leiserowitz, A., Maibach, E., Roser-Renouf, C., & Hmielowski, J. (2012). *March 2012 & Nov. 2011*. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change. Retrieved from: <http://environment.yale.edu/climate/files/Six-Americas-March-2012.pdf>

Morris et al. (in review).

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