

ABSTRACTS

SECTION VIII. ENVIRONMENTAL AND EARTH SCIENCE

SECTION VIII – ENVIRONMENTAL AND EARTH SCIENCE

Paper Session

KCC Room D

Thursday afternoon, 2:00 –4:00 PM

Steven Schultze, Presiding

1. 2:00 PM ANOTHER DAM PROJECT: REMOVING THE SUCARNOCHEE RIVER DAM. *Brian Burnes*, Alabama Academy of Science. A low-head dam was removed from the Sucarnochee River at Livingston, Alabama. This presentation recounts a history of the dam and the many individuals and groups involved in its removal.
2. 2:20 PM **u THUNDERSTORM DEVELOPMENT AT THE SEA AND BAY BREEZE COLLISIONS. *Ashlyn Shirey* and Sytske Kimball, University of South Alabama. Sea breezes (SB) and bay breezes (BB) are common in the Mobile Bay region during the warm season: May through October. SBs and BBs form in response to a land-sea temperature gradient – a difference in temperature between land and water. SBs and BBs frequently occur at the same time in Mobile County due to land-sea temperature gradients between the land and the Gulf of Mexico and between the land and Mobile Bay. This occurrence leads to a collision between the SB and BB in the southeast corner of Mobile County that could lead to thunderstorm initiation at the collision zone. Thunderstorm (convection) development at the collision point depends on atmospheric instability, background environmental winds, and magnitudes of land-sea temperature gradients. A better understanding of what leads to thunderstorm development can help forecast location and time when storms form to prevent damages and injuries. In this study, KMOB radar data from the years 2010-2013 was examined to see which days had SBs and BBs. They were also categorized by whether convection developed or not. The days that had both SBs and BBs were also examined to see if convection occurred at the collision point. The number of non-convective days peaked during the months of September and October while the number of convective days peaked during July and August. The instability parameters, environmental winds, and land-sea temperature gradients were all calculated for each day. As expected, the convective days had instability parameters that indicated a more unstable environment compared to non-convective days. The high number of non-convective SB and BB days in October is due to the strong temperature gradients, but the stable conditions during that month does not allow for convection to develop. While July and August have relatively smaller land-sea temperature gradients, the more unstable environment during these months is why there is a peak of convective SB and BB days. Convection developing along the SB and BB front is highly dependent on instability parameters. However land-sea temperature gradients and the speed and direction of the environmental winds seem to be of secondary importance. The

instability of the atmosphere is crucial to thunderstorm development because even with strong temperature gradients and favorable wind patterns, if the environment is too stable then thunderstorms will not develop.

3. 2:40 PM ****u IDENTIFYING SEA AND BAY BREEZE DRIVEN CONVECTION AND COMMON LOCATIONS FOR INITIATION IN MOBILE COUNTY, ALABAMA.** *Samantha Darring* and Sytske Kimball, University of South Alabama. Sea and bay breeze driven thunderstorms are a common occurrence along the Gulf of Mexico Coast every summer. These summertime thunderstorms pose a problem to forecasters, due to the difficulty of predicting the exact location of development. These storms can cause flash flooding, strong winds, and plentiful lightning, that can cause serious damage to property and even life. However, in terms of agriculture, these thunderstorms can be beneficial to farmers who count on this almost daily rain for their crops. This research will identify the most common location where these storms initiate due to sea or bay breezes in Mobile County, Alabama. In this project, sea and bay breeze driven convection (i.e. thunderstorms) will be identified for the years 2009, 2010, 2011, and 2012 using radar data from the Mobile Doppler weather radar (KMOB WSR-88D). Three different triggering mechanisms will be analyzed in order to identify the reasons why the convection might form in a given location. These mechanisms include the sea and bay breeze interaction with elevation, the collision of sea and bay breezes, and the vertices in the sea or bay breeze formed by the natural shape of the coastline. The locations of all three of these convective initiation types were mapped using ArcGIS to help identify the most common location for the development of these summertime thunderstorms. The results indicate that most sea breeze driven thunderstorm storms occur in the lower part of Mobile County. From radar imagery, it was observed that two vertices typically occur in the sea breeze front in Mobile County. Convection was observed to form in these vertices as well as in the southeastern part of the county where the sea and bay breeze collide. The ArcGIS maps show that the vertices and the interaction between the sea and bay breeze are the most common producers of sea breeze or bay breeze driven convection. The sea or bay breeze interaction with elevation, as show in the ArcGIS maps, is not as evident as the vertex mechanism. This is possibly because the majority of the storms formed in the lower 13-15 miles of the country, before higher elevations occur.
4. 3:00 PM **SUMMER IN THE CITY: HEAT TRENDS IN URBAN ALABAMA, 1957-2017.** *Stephen Tsikalas*, Kennedy Delap, Jacksonville State University; Eastern Washington University. In this study, we focus our attention on urban regions in the State of Alabama to create a better understanding of changing summer heat trends. Rising summer temperatures, prolonged heat waves, and high heat index values are cause for public health concerns. Additionally, an increase in summer heat poses a stress on energy demands, costs to consumers, and health risks to the most vulnerable populations. Alabama is within the “warming hole” of the twentieth century warming trend in the U.S.; however, we hypothesize that summer urban temperatures have been on the rise over the past 60 years. To test our hypothesis, we analyze daily maximum and minimum temperatures for the months of June, July, and August between two, thirty-year time periods: 1958 to 1987 and 1988 to 2017. We also calculate cumulative summer cooling degree days (CDD) for each year, June 1st through August 31st. Statistical comparisons suggest a rising maximum and minimum temperature and CDD for 80 percent of the cities in this study ($\alpha = 0.05$).

5. 3:20 PM ****u** COMPARISON OF PEACH RESPONSE TO WEATHER IN ALABAMA AND MICHIGAN. *Jerel Foreman* and Steven Schultze, University of South Alabama. Specialty crops are dependent on the climates that they grow in. This study seeks to show the differences between growing peaches in state of Alabama and the state of Michigan. Peach production is an important part of both states' agricultural economies, thus it is important to better understand the complex interaction between these crops and their environments. We placed 6 EXTECH RHT10 weather microloggers in radiation shields and record temperature, humidity, and dew point in a peach grove in Fairhope, Alabama and Berrien Springs, Michigan recording data every five minutes for the early growing seasons for peach trees. Ultimately, we found that the climates of Alabama and Michigan are different even though the crops grew at the same rate. Peach production is an important part of both states' agricultural economies; thus, it is important to better understand the complex interaction between these crops and their environments.
6. 3:40 PM ****u** RESULTS FROM YEAR TWO OF THE SOUTH ALABAMA HOPS PROJECT. *Wayne Williams* and Steven Schultze, University of South Alabama. *Humulus lupulus*, or hops as known to many, are a plant species which grows on a vine and is used in the production of alcoholic beverages, mainly beer. These plants are generally grown in between the 35- and 55-degree latitude lines, and thrive greatly in the Pacific Northwest of the United States. The goal of this experiment was to see if hops could in fact be grown in the lower Alabama region, closer to the 30-degree latitude line. In the first year(2017) of the experiment, we attempted to grow 15 hops vines. We were not able to obtain a crop due to many mistakes and unforeseen circumstances that had come about. This being the second year of production, things have drastically improved in every manner of the project. There has been a new irrigation system installed, and we have grown the hops and fertilized them in a completely different way. We have used the chinook, cascade, Kirin 2, and southern brewer varieties of hops. We have upped production from 15 vines to about 50 vines. This year we have had great blooming results of hops. Every variety of plant has bloomed at some point, but some in different time stages than others. Many have been picked and have continually bloomed more hops after being picked. All of the crops are fresh and usable product, as much as 89% of the plants have produced hops! This was something we did not foresee working out as well as it did. By finding success, we have high outlooks for this experiment and bringing hops to our local economy in mass production someday in the future. Hops will be continued in research for years to come.

4:00 PM BUSINESS MEETING: Elect a Section Vice-Chair for the 2019-2021 term

****u or **g** Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION VIII – ENVIRONMENTAL AND EARTH SCIENCE

Poster Session

Thursday Afternoon, 1:00 – 2:00 PM

KCC Atrium and Ballroom Foyer

Authors Set-up: Begins at 7:30 AM

Authors Present: 1:00 – 2:00 PM; Judging and Viewing

Steven Schultze, Presiding

1. **DENDROCLIMATIC RELATIONSHIPS ACROSS THE GEOGRAPHICAL RANGE OF SUGAR MAPLE.** *Kaylen Bendolph*, University of West Alabama; *Carolyn Copenheaver*, Virginia Tech; *Ketia Shumaker*, The University of West Alabama. Climate change poses one of the largest threats to forest ecosystems in North America, but we do not fully understand how current climate influences tree growth. The objective of this study was to connect sugar maple radial growth to temperature across a portion of the geographic range. Monthly temperature data were correlated with sugar maple tree-ring width data from 12 sites in the United States and Canada. Current and prior year's summer temperatures were the main drivers of sugar maple radial growth. Sites from the central portion of sugar maple's range were less responsive to temperature than sites at the northern and southern range limits. These results suggest that climate change is likely to affect sites at the northern and southern limits more than in the central portion of sugar maple's range.
2. **A META-ANALYSIS TO COMPARE SOLUTIONS TO BIRD WINDOW COLLISIONS.** *Jessica Colbaugh*, Robert Gitzen, and Christopher Lepczyk, Auburn University. Bird window collisions happen throughout the year, taking place in rural and urban habitats with deaths documented for many groups of birds. Birds are unable to perceive glass itself as a barrier, and instead are attracted to the reflections on the surface or suitable habitat on the other side. Window treatments have been developed to reduce collisions, and some comparisons have been done within studies. However, there hasn't been a systematic review of developed solutions. This meta-analysis was designed to provide an overall effect of treatments as well as systematically compare different window treatments using rate ratios to find which solutions had the best effect for reducing collisions. Following PRISMA guidelines we found eight studies, for a total of 34 effect sizes. A random effects model comparing each solution identified a commercially available one-way glass called CollidEscape, UV absorbing and reflecting alternating pattern to completely cover the window, and vertical stripes of UV absorbing 2.5 cm wide spaced 5 cm apart as the top solutions. A mixed effects model was used to moderate and compare grouped treatments, grouped based on physical similarities. The mixed effects model accounted for a fair amount of heterogeneity and identified glossy black horizontal stripes (2 mm thick and spaced 28 mm apart) and parachute cords as the best options. The overall effect was that the treatments reduced collision rate by about 80% compared to clear glass. The solutions found to be effective are feasible for application anywhere from homes to businesses.
3. **WARMING HOLES AND POLAR JETS: TEACHING CLIMATE CHANGE IN THE SOUTHEASTERN U.S. BY EMBRACING THE REGIONAL ANOMALIES TO GLOBAL WARMING.** *Gregory Buckley* and *Melissa Moore-Driskell*, University of North Alabama. Despite overwhelming scientific consensus that the earth's climate is changing rapidly, and that human activity is largely responsible, there remains a significant percentage of the population that remains skeptical. It is especially challenging to teach about climate change in a region that has not experienced the same warming trends as the rest of the world. Such is the case in the Southeast United States, where a "warming hole" experienced significant cooling beginning in the late 1950's while the rest of the world was warming. This region still falls below average global

temperature anomalies, suggesting that the warming hole still exists. Additionally, progressive warming of the Arctic has resulted in greater instability of the northern polar jet stream, which can bring frigidly cold winter weather to the southeastern United States. Climate system drivers are complex; however, by addressing this complexity and encouraging exploration into the causation of anomalous evidence on a regional scale, it is easier to explain the broader patterns and implications of global climate change. This teaching/learning module reinforces inquiry-based learning, critical thinking, and analytical skills while introducing students to some of the basic concepts of the Earth's climate. This is accomplished through the analysis of archived local weather data in the southeastern U.S. extended over decades to demonstrate the difference between weather and climate. Comparisons are made between historical local temperature trends with temperature trends outside of the "warming hole". Students will 1) determine what available weather data are most informative to examine long-term climate change; 2) examine several of the theories to explain why regional trends differ from global trends, and 3) examine the drivers of our regional climate, particularly the importance of the jet stream.

4. ****u** TEMPORAL CHANGES IN THE RELATIONSHIP BETWEEN CLIMATE AND RADIAL GROWTH OF SUGAR MAPLE. *Makael Harris* and *Ketia Shumaker*, The University of West Alabama; *Carolyn Copenheaver*, Virginia Tech. Sugar maple radial growth is determined by environmental conditions. The objective of this study was to analyze the changes over time in the relationship between sugar maple annual radial growth and precipitation in 12 study sites across the U.S. and Canada. Results show a declining influence of precipitation on sugar maple radial growth post-1970. This implies that environmental factors other than precipitation are increasing in their influence on sugar maple growth.

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