

The Trilogy of the Rings: My Quest for Rings of Good Oak in Three Dendrochronological Studies

This summer's internship was a continuation of the dendrochronological research, or tree-ring science, that I did the previous two summers. The research I did this summer differed from that of the past due to my expanded role and responsibilities as a dendrochronology assistant from training I received in tree-ring analysis software this past spring. This increased experience in dendrochronology led me to take part in a total of three research projects this summer: 1) old-growth forest dynamics at Savage Gulf State Natural Area (SGSNA), 2) forest-inventory data at Percy Warner Park, Nashville, and 3) dendrochronological dating of a 19th century Tennessee log cabin.

My summer internship began with a full week spent at the University of Alabama at Tuscaloosa assisting Dr. Justin Hart, Professor of Geography, and his lab coordinator, Megan Buchanan, with dendrochronological analysis of tree ring data from Savage Gulf that I and others have compiled over the last three years. Using a variety of software, I helped confirm the accuracy of the dated tree cores (COFECHA), standardized and detrended raw ring-width data (ARSTAN), determined significant climate signals in standardized ring indices (SASS), and reconstructed canopy disturbance events using percent growth equations (Excel). This experience not only allowed me to assist in finalizing this data set so that the scientific study being conducted at Savage Gulf State Natural Area can conclude with a series of publications in professional journals, but it also provided me with valuable experience working with a graduate student, and a full time professor in charge of my choice graduate program.

The second phase of this summer's internship involved starting a new scientific study in a tract of late-successional forest at Percy Warner Park in Nashville. I assisted Dr. Scott Torreano, Professor of Forestry, Sewanee, in collecting inventory data in thirteen 0.04 ha forested plots which involved arduous hikes, long hours, oppressive heat indices, and hungry ticks!!! At each plot, we recorded a tree's species, canopy position, diameter at breast height (dbh), live crown ratio, height, and snag class if applicable. Using an increment borer, we also cored trees meeting criterion for old-age. The tree cores were later dried, mounted, sanded, and dated with a microscope. Although this study at Percy Warner Park is still in its infancy, the data collected this summer will aid the state and Nashville Metro governments in creating management plans for the newly-acquired property. We are the first researchers to inventory and study this forest at large, and thus I was very fortunate to take part in the genesis of this project.

The remainder of my internship involved the start of another new research project in Crawford, Tennessee. There, I worked with Dr. Stacy Clark (US forester, USDA Forest Service) to date a historic log cabin using dendrochronological dating techniques on a white oak floor beam removed during repair work on the structure's foundation. The log was transported back to Dr. Clark's lab at the University of Tennessee at Knoxville's campus so that it could be prepared for dating. Before the log could be assigned a date, a local tree-ring chronology was made to match up signature years, or rings with below average growth due to drought, of local trees to those found in the white oak beam. To construct this chronology, fifteen trees exhibiting characteristics of old age were cored on the land owner's property.

Returning to the lab in Sewanee, the tree cores were dried, mounted, and sanded prior to dating. After all cores had an estimated date, I traveled to Knoxville where I spent a week working with Dr. Clark in her UT lab. My first assignment involved sanding two, cross-sectional discs, commonly referred to as “cookies”, of the white oak floor beam retrieved from the log cabin. Each cookie was sanded with progressively finer abrasives to reveal the ring structure of the wood. I then employed the use of a microscope to count the number of annual rings each cookie contained.

After the number of rings had been determined for each cross section, we measured each ring-width to the nearest 0.001 mm. The raw ring-width measurements were then uploaded in COFECHA, a dendrochronological software program that uses correlations to assign raw ring-width measurements to the correct calendar year. For a trial run, we compared these ring values to those ring widths in regional tree-ring chronologies, such as the chronology we compiled from Savage Gulf, from the International Tree-Ring Database (ITRD).

After getting estimated dates for the two cookies based on these regional tree-ring chronologies, I repeated the same measuring procedure on the tree cores retrieved from the landowner’s property. Due to slight differences in climate across a spatial scale, these tree-ring measurements provide the most accurate means of assigning a date to the cookies, and thus the log cabin. This local chronology comprised of the fifteen tree cores was crossdated with both cross sections of the cabin’s floor beam, which contained at least 185 annual growth rings. Based on both the regional and local chronologies, we estimate that the cookies date back to the mid-17 century, thus dating the cabin around 1850. To refine the date of this structure, a more extensive local tree ring chronology is needed, which will require us to core more trees on the landowner’s property. As an independent study for the advent 2011 semester, I will be assisting Dr. Clark in the continuation of this research.

This summer's internship was unmatched in the amount of exposure I received in networking with forestry professionals, what I learned in dendrochronology, and the experience I gained in scientific research. I was very fortunate to be a part of three, separate scientific studies which were all in different phases of completion. When I started my first Sewanee internship following my freshman year, I had never imagined scientific research, particularly dendrochronology, would be my capstone achievement in my career at Sewanee nor did I thought I would help contribute invaluable knowledge to the scientific community. That very first summer, that one decision to take part in a Sewanee-funded internship, made all of this a reality, and continues to spring forth opportunities as I start my exodus out of Sewanee this senior year. Therefore, to those of you interested in applying to an internship, seize this opportunity because the possibilities are endless!

KID, YOU'LL MOVE MOUNTAINS!

So...be your name Buxbaum or Bixby or Bray

or Mordecai Ali Van Allen O'Shea,

you're off to Great Places!

Today is your day!

Your mountain is waiting.

So...get on your way!

-Oh, the Places You'll Go! by Dr. Seuss