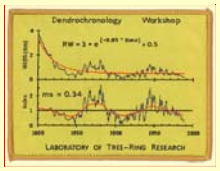
LABORATORY OF TREE-RING RESEARCH



University of Arizona

Laboratory of Tree-Ring Research

2017 Summer Presession Courses in Dendrochronology

May 15 — June 2, 2017


Map of LTRR
(click to see larger image)


Historical concept of LTRR
(click to see larger image)

Course Objectives

The objectives of the Summer Presession Courses in Dendrochronology include:

- Cover basic background of dendrochronology, the study of tree rings
- Practice the accurate dating of the year of formation of tree rings, using multiple techniques
- Understand features of tree rings that can be measured and used to assess/reconstruct environmental signals and/or to date events of the past
- Learn by experience aspects of fieldwork in dendrochronology, including recording field notes electronically
    - Additionally in the field, visit and see first-hand the iconic sites of the Grand Canyon, Sunset Crater, Wupatki, and Montezuma Castle and Well, and learn of their historical significance in the science of dendrochronology
- Learn by experience wood shop techniques of preparing dendrochronological specimens for analysis
- Learn by experience the measurement of ring width and data management and sharing
- Learn by experience the use of specialty software for analyzing tree-ring data
- Synthesize replicated dendrochronological data into a defensible interpretation
- Make short, formal presentations of results to a general audience
- Specialize in a specific subdiscipline of dendrochronology:
    - **Archaeology**: Dating of past events of human origin, as well interpreting those events in climatological/ecological contexts
    - **Climatology**: Modeling modern tree-ring patterns with meteorological data and then reconstructing climatic variability of the past, as well as interpreting high- and low-frequency temporal variability in archaeological/ecological contexts

- **Ecology**: Discerning non-climatic signals in tree-ring series that might be ascribable to ecological processes such as fire, insect outbreaks, hillslope positioning, and/or forest management treatments, as well as interpreting ecological events of the past in archaeological/climatological contexts

Professors

Dendroecology

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Dendroecology

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Dendroclimatology

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Other Lecturers

- Dr. Dave Meko
- Dr. David Frank
- Dr. Malcolm Hughes
- Dr. Steve Leavitt
- Dr. Ann Lynch
- Dr. Margaret Evans
- Dr. Tomasz Wazny
- Dr. Jeff Dean
- Dr. Don Falk
- Dr. Erica Bigio
- Dr. Chris Guiterman
- Dr. Soumaya Belmecheri
- Dr. Irina Panuyskina
- Dr. Bethany Coulthard
- Mr. Kai Lepley
- Dr. Martin Munro (the LTRR IT guy)
- Dr. Pete Fulé, NAU Forestry
- Dr. Cheryl Miller, NAU Centennial Forest
- Ms. Amanda Grady, USFS Forest Health Protection

Teaching Assistants and Administration

- Ms. Rebecca Renteria
- Mr. Alex Arizpe
- Mr. James Wilcox
- Ms. Marianne Hamilton

What to Bring for Tucson and for Fieldwork

Tucson: Mid May and early June will be hot during the day and mildly warm at night. Click here for local weather, then click on Tucson on the map for 5-day forecast. **Note**: The LTRR classroom is often kept cooler than preferred, so perhaps bring a sweater to class each day while in Tucson.

- Academic casual attire will suffice for most activities.
- Hat and sunglasses highly recommendable.
- Sunscreen also a good idea for outdoor activities lasting more than an hour.
- Personal laptop:
    - Martin (LTRR IT) has provided instructions on Wifi access while here.
    - **For PCs and Java applets**: It's looking like Internet Explorer (IE) is the last browser left still running Java applets, e.g., our applet tool for teaching online how to crossdate by skeleton plotting. Neither Chrome nor Firefox supports applets anymore. Unfortunately, IE runs only on PCs (not Macs). If your laptop is a PC, please have IE installed as a browser, and follow these instructions to enable Java applets:
        1. Click Tools and then Internet Options
        2. Select the Security tab, and select the Custom Level button
        3. Scroll down to Scripting of Java applets (almost the very bottom)
        4. Make sure the Enable radio button is checked
        5. Click OK to save your preference
    - **For Macs and Java applets**: On recent Macs, Java is not pre-installed or available through Apple, but Java can be downloaded in the usual way from here (the link to do this is clearly displayed on the main page there). Once installed, the built-in web browser on Mac OS, Safari, should be able to run the applet, but, as usual, various security warnings and must be selected to proceed before the applet will appear for the first time. Older Macs had a version of Java provided through the system, but Apple stopped supporting that a while ago.
- PC vs Mac: DPL software runs for sure on PCs, and probably also on Macs after some work-arounds.
- Don't forget a thumb drive for easy copying, storing, and sharing of data files.

Tucson after hours:

- Things to do around campus, the Main Gate
- Things to do downtown (get there by the streetcar)
- Downtown restaurants
- Restaurant & bar guide (pdf file)

Fieldwork: Northern Arizona and New Mexico will be cooler, with at least some chance of rain.

- Long clothing (pants and shirt) required for field days
- Hiking boots required for field days (lighter shoes ok for evening)
- Hat, sunglasses, and sunscreen essential, maybe a bandana also
- Cold weather clothing (jacket, gloves, balaclava, raingear), just in case
- Small daypack
- Personal water bottles, travel mugs
- Personal GPS units desired (but not required)
- Personal increment borer, if you have one
- Gloves for coring, as preferred
- Personal Android device, if you have one
- Personal medications (personal medical issues?)
    - If you have a serious medical condition that requires daily medication, you must (a) inform the instructor in advance of the field trip, and (b) bring at least a 1 week supply of the medication
- Personal first-aid kit, as desired
- Insects are not usually a problem in high country of New Mexico and Arizona in late spring. Perhaps the occasional mosquitos at dusk, but ticks are not as bad here as in other places of the US. Long clothes help ward off insects. Still, feel free to bring repellent as desired.

Overnight accommodations in the field:

- **All**: Fieldtrip lodging and food expenses will be covered by the Presession fees.
- **Archaeology**: Camping gear will be needed for part of this trip, though you'll be at the Merriam-Powell Research Station of Flagstaff for May 23 & 24.
- **Climatology**: Motel rooms are reserved for this trip.
- **Ecology**: The Ecology class will stay at the Merriam-Powell Research Station of Flagstaff. This station has bunk rooms (pillow and a light blanket are provided, but not linens), showers (bring your own towel), a kitchen, and group amenities. If you have a sleeping bag and can conveniently bring it, please do so. Food and meal planning for this fieldweek will be discussed in class, Friday, May 19.

Tentative Schedule (subject to change)

Monday, May 15

Time	Archaeology	Climatology	Ecology
8:00-8:30	Arrival, coffee and bagels available		
8:30-9:30	Welcome and introductions: faculty, staff, and students		
9:45-10:45	Lecture: Physical and biological basis of tree rings (Steve Leavitt) Speer: Botanical basis of dendrochronology Bowyer et al.: Tree growth & woody tissue Bowyer et al.: Composition & structure of wood cells Bowyer et al.: Softwood structure Bowyer et al.: Hardwood structure Vaganov et al.: Mechanistic model of tree-ring growth Steve's powerpoint slides		
11:00-12:00	Lecture: Essential resources for dendrochronology (Paul Sheppard) Web: Henri's Ultimate Webpages on Dendrochronology Facebook: Tree-Ring Times The International Tree-Ring Data Bank DendroBox, a quick way to access ITRDB data sets The International Multiproxy Paleofire Database Online Biblio of Dendrochronology Books: Fundamentals of Tree-Ring Research (Click here for a book review of Fundamentals) Tree Rings and Climate An Introduction to Tree-Ring Dating USGS: Collecting, Preparing, Crossdating, and Measuring Tree Increment Cores Journals: Tree-Ring Research, with access to high quality pdfs of past TRR papers Dendrochronologia Classic NGM issues: National Geographic (March 1958): Bristlecone Pine, Oldest Living Thing National Geographic (December 1929): Bridging the Gap Professional society: The Tree-Ring Society		
12:00-1:00	Break for lunch (Highland Market is nearby, see blue circle in map above, or click here)		
1:00-2:00	Lab: Crossdating by Skeleton Plotting (Paul Sheppard, using the applet) Sheppard: On the crossdating applet teaching tool		
2:00-4:30	Lab: Crossdating of Zuni Mt. specimens by Skeleton Plotting (Jesse Minor et al.) LTRR Introduction to Dendrochronology Handbook		
4:30-5:00	A few student presentations: background and research (bring a powerpoint with a few slides, e.g., a map, a couple field shots, research objectives), and expect to fill ~5 minutes of presentation time. Everyone participates.		

Tuesday, May 16

Time	Archaeology	Climatology	Ecology

8:30-9:30	Lecture: Tree-ring dating: what is it, how is it done? (visual dating, measurement matching) (Ron Towner) Douglass 1941: Crossdating (a classic) Slides for this lecture	
9:45-10:45	Lecture: Tree-ring characteristics that can be measured: TRW, EW, LW, false banding, density, resin ducts (Malcolm Hughes, confirmed) Vaganov et al.: Tree-ring structure in conifers Malcolm's powerpoint slides	
11:00-12:00	Lecture: History of Dendroarchaeology (Ron Towner, classroom) Slides for this lecture	Lecture: Dendrodemography (Margaret Evans, confirmed, conference room) Macalady & Bugmann: Predicting tree mortality Iniguez et al.: Historical forest age structure Biondi: Tree-rings vs forest inventories, Gus Pearson Forest Slides for this lecture
12:00-1:00	Break for lunch	
1:00-2:00	Lab: Crossdating exercises (in classroom)	Lab: Crossdating by Yamaguchi character list technique (Paul Sheppard, in conference room) Yamaguchi: Character list crossdating Speer: List method Representative data form for character list technique
2:00-4:30	Lab: Continue Crossdating of Zuni Mt. specimens (Jesse Minor et al.)	
4:30-5:00	A few student presentations: background and research (bring a powerpoint with a few slides, e.g., a map, a couple field shots, research objectives), and expect to fill ~5 minutes of presentation time. Everyone participates.	

Wednesday, May 17

Climatology leaves for the field, 8:00 AM departure time, arrive to Sunset Crater by midday
Lecture in the field: Site & tree selection, sampling strategies, field techniques
Grissino-Mayer: Species used in dendrochronology

Time	Archaeology	Ecology
8:30-9:30	Lecture: Principles: limiting factors & ecological amplitude (Ron Towner) Fritts et al.: Tree rings along a vegetational gradient	
9:45-10:45	Lecture: Principles: site & tree selection (Don Falk confirmed) Grissino-Mayer: Species used in dendrochronology	
11:00-12:00	Lecture: Principles: uniformitarianism (but, age effects & divergence) & linear aggregate model (Paul Sheppard) Speer: Uniformitarianism Szeicz & MacDonald: Age-dependent dendroclimate modeling D'Arrigo et al.: Divergence Cook: Linear aggregate model	
12:00-1:00	Break for lunch	
1:00-2:00	Lab: Crossdating exercises (in classroom)	Lab: Crossdating with BAR plots and ITRDB chronologies (Paul Sheppard, in conference room) Grissino-Mayer & Fritts: ITRDB International Tree-Ring data Bank A representative BAR plot
2:00-4:30	Lab: Continue crossdating of Zuni Mt. specimens (Jesse Minor et al.)	
4:30-5:00	A few student presentations: background and research (bring a powerpoint with a few slides, e.g., a map, a couple field shots, research objectives), and expect to fill ~5 minutes of presentation time. Everyone participates.	

Thursday, May 18

Climatology in the field: continued sampling, then return to Tucson late afternoon

Time	Archaeology	Ecology

8:30-9:30	Lecture: Mediterranean dendroarchaeology (Tomasz Wazny, confirmed, conference room) Guidelines on dendro dating Wazny: Secrets of a Rembrandt School still life Wazny: Tibetan books	Lecture: Open Data Kit (ODK) theory & basics (Chris Guiterman, confirmed, classroom) OKD instructions for presession Brewer-Guiterman: ODK fieldwork
9:45-10:45	Lecure: Dendroarchaeology and human behavior (Jeff Dean, confirmed, conference room) Dean: Behavioral error in archaeological tree-ring dating	Field: ODK field practice on Highland Bowl Forest, including uploading data (Chris Guiterman et al., confirmed, classroom)
11:00-12:00	Lecture: Cambium peeled trees in the Zuni Mountains (Ron Towner, conference room) Towner & Galassini: Peeled trees of the Zuni Mountains	Lecture: Introduction to quantitative dendro analysis using R (Margaret Evans, confirmed, classroom) R project website R studio website dplR website Bunn: dplR Bunn: Intro to dplR
12:00-1:00	Break for lunch	
1:00-2:00	Lab: Continue crossdating of Zuni Mt. specimens (Jesse Minor et al.)	
2:00-4:30		
4:30-5:00	A few student presentations: background and research (bring a powerpoint with a few slides, e.g., a map, a couple field shots, research objectives), and expect to fill ~5 minutes of presentation time. Everyone participates.	

Friday, May 19

Time	Archaeology	Climatology	Ecology
8:30-9:30	Lecture: Basics of dendroarchaeology (Ron Towner) Nash: Time for collaboration, dendroarchaeology of the American Southwest Towner: Archaeological dendrochronology of the Southwestern US		
9:45-10:45	Lecture: Basics of dendroecology (Don Falk) papers?		
11:00-12:00	Tour: Labs of the Tree-Ring Building (Pamela Pelletier, confirmed)		
12:00-1:00	Break for lunch		
1:00-2:00	Lab: Continue dating Zuni Mountain specimens	Demonstration: Tellervo, in room 414 (Erica Bigio, confirmed) Brewer: Tellervo Tellervo download & access instructions	
2:00-4:30	Lab: Continue dating Zuni Mountain specimens (classroom)	Lab: Crossdating of San Pedro Mártir specimens (classroom)	Plan the menu for upcoming field week (conference room) Lab: Last day of crossdating of Zuni Mt. specimens by skeleton plotting (Jesse Minor et al.)
4:30-5:00	A few student presentations: background and research (bring a powerpoint with a few slides, e.g., a map, a couple field shots, research objectives), and expect to fill ~5 minutes of presentation time. Everyone participates.		
evening	UA Women's Softball is hosting 1st-round tournament games beginning tonight, here on campus. For live, top-tier college softball action, click here for info on how to buy tickets. Note: These games will sell out, so act fast if you'd like to do this while in Tucson.		

Saturday, May 20

Archaeology in the field: Tucson to the Zuni area. Excursion MUST leave Tucson by 7:00 AM (with everything packed)

Time	Climatology	Ecology
7:00-12:00	Optional: Morning outing to Arizona-Sonora Desert Museum (any LTRR staff who can drive). The ASDM is a world-renowned living museum of the Sonoran Museum, famously the "finest desert in the world." A must-see while in Tucson. We have a group entrance rate of $8.00 per person, but we must commit to a number of people in our group ahead of time. Please email Jesse (email address above) your desire to do this half-day trip or not.	
12:00-1:00	Break for lunch (Highland Market is not open on weekends)	

1:00-2:00	Lecture: Data formats & COFECHA (Paul Sheppard) TRiDaS Website Jansma et al.: TRiDaS Holmes: Computer quality control Grissino-Mayer: COFECHA manual Another COFECHA manual COFECHA Example 1: • Sunset Crater data, with issues • Output, with issues COFECHA Example 2: • Sunset Crater data, cleaned up • Output, cleaned up COFECHA Example 3: • Sunset Crater data, undated • Output, undated #1 • Output, undated #2
2:15-3:15	Lecture: ARSTAN (DPL version): Detrending and robust mean (Paul Sheppard) Fritts et al.: Modified negative exponential Excel spreadsheet not filled in Excel spreadsheet filled in Paul's first modified negative exponential Cook-Peters: Cubic smoothing spline Spreadsheet spline demo Cook: Robust Mean Spreadsheet robust mean Cook-Holmes: 1986 ARSTAN Users Manual 1999 ARSTAN Users Manual ARSTAN output
3:30-4:30	Lecture: Time-series properties (interannual variability & autocorrelation) (Paul Sheppard) Douglass: Mean sensitivity Strackee & Jansma: Mean sensitivity Bunn: Intro to dplR Biondi & Qeadan: Gini coefficient Bunn et al.: Mean sensitivity Spreadsheet of interannual variability measures Ed Wright demo of indices of interannual variability Yamaguchi: Crosscorrelation of tree-ring series Spreadsheet of cross-correlations

Sunday, May 21

Archaeology in the field: sampling cambium-peeled trees at Zuni.

Time	Climatology	Ecology
Daytime	Off	Purchase food for field week
Evening	Optional: Picnic dinner and open-air concert of the Tucson Pops Orchestra (any LTRR staff who can drive)	

Monday, May 22

Archaeology in the field: Sampling cambium-peeled trees at Zuni.

Ecology morning: start field week departing LTRR by 7:30 AM, drive to Flagstaff, arriving at Merriam Powell Research Station by noon
Ecology afternoon: Fire scar and fire effects sampling around MPRS (Don Falk)
Map of fire-scar specimens sampled previously at MPRS
Arno & Sneck: Fire history dendro techniques, especially how to collect partial cross-sections
Ecology late afternoon: cleaning, care, and sharpening of increment borers (Jesse Minor et al.)

Ecology dinner: at Merriam Powell (menu TBD, beverages)
Ecology evening (7:00 PM): Invited lecture: Ecological history of ponderosa pine of the Mogollon Rim (Pete Fulé confirmed)

Time	Climatology
8:30-9:15	Lecture: Introduction to standardization & time-series properties (Dave Meko & Ramzi Touchan) papers?
9:30-10:15	Lecture: Tree rings as proxies of past climate, hydrology, plant physiology, and carbon cycle (Soumaya Belmecheri) Water use efficiency across European forests
11:00-4:30	Lab: Sample preparation & dating specimens
5:00-5:30	General discussion
5:30-6:00	Student presentation

Tuesday, May 23

Archaeology: Drive to Flagstaff, leaving Zuni by 8:00 AM, arriving at Sunset Crater by 1:00 PM.

Ecology 8:00 AM: At MPRS, Centennial Forest overview (Dr. Cheryl Miller, Centennial Forest Manager, NAU)
Ecology 8:30 AM: to Centennial Forest for fieldwork (Paul Sheppard et al.)
Ecology early lunch: back at MPRS
Archaeology & Ecology 1:00 PM: Meet at Sunset Crater to discuss dating of the eruption and tornado effects (Paul Sheppard)
Archaeology Southwest: Dating Sunset Crater
Sheppard et al.: Tree-ring responses to a tornado at Sunset Crater
Archaeology & Ecology 3:30 PM: Reconvene at Wupatki (Ron Towner)
Archaeology & Ecology 7:00 PM: Dinner at the Kachina Downtown Restaurant in Flagstaff (click here to open a menu for Mexican fare and follow instructions therein)
Ecology evening: Back at Merriam Powell: mount Monday's cores (Jesse Minor et al.)

Time	Climatology
8:30-9:15	Introduction to ARSTAN (Windows version) (Ramzi Touchan & Dave Meko) 1999 ARSTAN User's Manual
10:00-11:00	Lecture: Living with the star: search for abnormal sun in the past with C-14 in tree rings (Irina Panyushkina) Dee & Pope: Anchoring historical sequences with astro-chronological tie-points Miyake etal.: The 5480 BC ^{14}C excursion
1:00-4:30	Lab: Continue sample preparation & dating specimens
5:00-5:30	General discussion
5:30-6:00	Student presentation

Wednesday, May 24

Archaeology: Sampling Red House.

Ecology early morning: Drive to Bull Basin
Ecology mid morning: Pumpkin Fire commentary, no sampling (Don Falk)
Ecology mid morning: Insect overview with Amanda Grady, USFS Forest Health Protection
Ecology late morning: Begin sampling at forest insect site (Ann Lynch)
Ecology early afternoon: Continue and finish sampling at forest insect site (Ann Lynch)
Ecology mid afternoon: Drive back to Merriam Powell
Ecology late afternoon: Mounting Tuesday's cores (Jesse Minor et al.)
Ecology and Archaeology dinner: at Merriam Powell (menu TBD, beverages)

Ecology and Archaeology evening: Journal club: Merging dendroarchaeology and dendroecology. For this, please read any article of your choosing from the Fall 2016 Archaeology Southwest Magazine, Volume 30, Number 4 (click here for a pdf, biggish at 16 megs), and be prepared to speak about it in order to initiate general discussion (Paul Sheppard et al.)

Time	Climatology
8:30-9:15	Lecture: Signal identification: response functions (Dave Meko & Ramzi Touchan) Meko et al.: SEASCORR: seasonal climate signals in tree rings
10:00-11:00	Tellervo and measuring, emphasis on earlywood/latewood (Kai Lepley)

1:00-4:30	Lab: Measuring dated specimens
5:00-5:30	General discussion
5:30-6:00	Student presentation

Thursday, May 25

Archaeology: Leave Flagstaff by 7:30 AM, stop to see Montezuma Castle & Well, arrive in Tucson ~4:00 PM.

Ecology morning: Grand Canyon Desert View Rd. site (demography and thinning sampling) (Paul Sheppard & Ann Lynch)
Ecology afternoon: Grand Canyon Rowe Well Rd. hillslope site (hillslope gradient sampling) (Paul Sheppard & Don Falk)
Miller & Schaetz: Hillslope positions & ecological influence

Ecology 5:00 PM: Dinner: pizza, etc., in Tusayan
Ecology 7:34 PM: Sunset at Mather Point, Grand Canyon, one of the Southwest's great spectacles
Ecology late evening: Drive back to Flagstaff and Merriam Powell

Time	Climatology
8:30-9:15	Lecture: Transfer functions: basic ideas (Dave Meko & Ramzi Touchan) Meko & Touchin: San Pedro Mártir precipitation
10:00-11:00	Lecture: Tree rings as proxies for semi-arid ecosystem productivity (Bethany Coulthard) papers?
11:00-4:30	Lab: Continue measuring
5:00-5:30	General discussion
5:30-6:00	Student presentation

Friday, May 26

Archaeology: Off, laundry, rest, etc.

Ecology early morning: Mount Wednesday's and Thursday's cores (Jesse Minor)
Ecology 10:30 AM: Depart for Tucson
Ecology afternoon: Drive back to Tucson, with stops at Montezuma Castle and/or Montezuma Well
Ecology late afternoon at LTRR: download all field notes from tablets/phones to a common space

Time	Climatology
8:30-9:15	Lecture: Climate signals in tree-ring isotopes (Steve Leavitt) McCarroll & Loader: Stable isotopes in tree rings
10:00-11:00	Lecture: Streamflow reconstructions (Dave Meko) Woodhouse & Gray: Colorado River streamflow reconstruction
11:00-4:30	Lab: Continue measuring
5:00-5:30	General discussion
5:30-6:00	Student presentation

Saturday, May 27

Time	Archaeology	Climatology	Ecology
Morning	Off, laundry, rest, etc.	Lecture: Conifer growth response to snowpack across an elevational gradient in the Northern Sierra Nevada Mountains, California (Kai Lepley) papers? --- Introduction to micro-projects	Off, laundry, rest, etc.
12:00-1:00	Break for lunch		
Afternoon	Off, laundry, rest, etc.	Lab: Continue measuring --- General discussion	Off, laundry, rest, etc.

Sunday, May 28			
Time	Archaeology	Climatology	Ecology
Daytime	Optional: Drive tour up the Catalina Mountains to Mt. Lemmon, to experience our nearby Sky Island Don's Sky Island overview Depending on level of interest, this activity will depart LTRR at ~7:00 AM and return by early afternoon. Bring lunch and water. --- Otherwise: Off, laundry, rest, etc.		
Evening	Optional: Picnic dinner and open-air concert of the Tucson Pops Orchestra (any LTRR staff who can drive)		

Monday, May 29			
Time	Archaeology	Climatology	Ecology
8:30-9:30	Lecture: basics of dendroclimatology (David Frank, confirmed) Touchan et al.: Jemez NM precipitation reconstruction		
9:45-10:45	Lecture: Interpreting dates and behavior case study #1 (conference room) Lightfoot 1992: Dendro dating of Duckfoot, Southwestern Colorado	Lecture: Drought history from tree rings from Northern Africa and Eastern Mediterranean Basin (Ramzi Touchan, Room 415) Touchan et al.: Drought reconstruction across the eastern Mediterranean Touchan et al.: Drought reconstruction across the western Mediterranean	Lecture: Measuring and verifying accuracy (Paul Sheppard, classroom) Grissino-Mayer: Measurement checking
11:00-12:00	Lab: Sample sanding in woodshop	Continue micro-project	Planning: Organizing Grand Canyon specimens and plan afternoon's work (Paul Sheppard et al.)
12:00-1:00	Break for lunch		
1:00-2:00	Lab: Crossdating samples from fieldwork	Continue micro-project	Lab: Belt sanding & other shop tools (Jesse Minor et al.) Minor & Arizpe: Trimming down cross-sections
2:00-6:00		General discussion	Crossdating, measurement, cursory analysis of Grand Canyon specimens (Paul Sheppard et al.). Upload day's data to common space.

Tuesday, May 30			
Time	Archaeology	Climatology	Ecology
8:30-9:30	Lecture: Climate change in the Four Corners and adjacent regions: Implication for past human occupation on the southern Colorado Plateau (Jeff Dean, confirmed, classroom) Dean & Funkhouser: Dendroclimate of the Southern Colorado Plateau		Lecture: BAI calculations and interpretation (Paul Sheppard, conference room) papers?
9:45-10:45	Lecture: Interpreting dates case study #2 (who? conference room) Street: Dendroarchaeology of Long House, Mesa Verde	Lecture: Changes in the frequency of extreme events (Paul Szejner, room 415) papers?	Lecture: Demonstration of EXTRAP, applications in geomorphology and ecology (Paul Sheppard, classroom) papers?
11:00-12:00	Lab: Sample sanding in woodshop	Lecture: Climate and fire history in the Jemez Mts (Ramzi Touchan, room 415) Touchan et al.: Fire history and climate of Jemez Mountains	Planning: Organizing Centennial Forest specimens and plan afternoon's work (Paul Sheppard et al.)
12:00-1:00	Break for lunch		
1:00-2:00	Lab: Crossdating samples from fieldwork	Continue micro-project --- General discussion	Lab: Belt sanding & other shop tools (Jesse Minor et al.)

			Sand both the Centennial Forest and the insect site cores
2:00-6:00			Crossdating, measurement, cursory analysis of Centennial Forest specimens (Paul Sheppard et al.). Upload day's data to common space.

Wednesday, May 31			
Time	Archaeology	Climatology	Ecology
8:30-9:30	Lecture: Recognizing insect signals in wood and ring-width series (Ann Lynch) Swetnam et al.: Using dendrochronology to measure defoliated trees Lynch: What tree-ring reconstruction says about defoliator outbreaks O'Connor et al.: Post-fire dynamics affect spruce beetle outbreaks		
9:45-10:45	Lecture: Slash and trash: lessons from a 20th century logging camp (Ron Towner, conference room)	Continue micro-project	Lecture: Forest insect ecology & outbreak dynamics (Ann Lynch) papers?
11:00-12:00	Lecture: Interpreting dates case study #3 (who? conference room) Nash, Snead pubs	General Discussion (room 415)	Lecture: Dendroentomology: reconstructing outbreaks (Ann Lynch) papers?
12:00-1:00	Break for lunch		
1:00-2:00	Lab: Crossdating samples from field trip	Continue micro-project	Demonstration of OUTBREAK (Ann Lynch) OUTBREAK software (a zip file) Planning: Organizing insect specimens and plan afternoon's work (Ann Lynch et al.)
2:00-6:00		General discussion	Crossdating, measurement, cursory analysis of fire specimens (Ann Lynch et al.). Upload day's data to common space.

Thursday, June 1			
Time	Archaeology	Climatology	Ecology
8:30-9:30	Dateless dendroarchaeology (Ron Towner, conference room)	Presentation preparation (room 415)	Lecture: Low-severity fire regimes, FHAES (Don Falk, where?) Falk et al.: Multi-scale controls of historical fire regimes Fire History Analysis and Exploration System
9:45-10:45	Lab: Sample prep in woodshop and crossdating		Lecture: Mixed- and high-severity fire regimes (Don Falk) Margolis et al.: Stand-replacing fire in the American Southwest
11:00-12:00	????		Demo: burnr program (Chris Guiterman) burnr website burnr documentation Planning: Organize fire-scar specimens and plan afternoon's work (Don Falk et al.)
12:00-1:00	Break for lunch		
1:00-2:00	Crossdating samples from field trip	Presentation preparation (room 415)	Lab: Belt sanding & other shop tools (Jesse Minor et al.)
2:00-6:00			Crossdating, measurement, cursory analysis of fire-scar

			specimens (Don Falk et al.). Upload day's data to a common space.

Friday, June 2			
Time	Archaeology	Climatology	Ecology
Morning	Small group preparation of final presentations		
12:00-1:00	Break for lunch		
1:00-2:00	Small group final preparation of final presentations		
2:00-4:00	Small group presentations		
4:00-5:00	Presentation of certificates (David Frank), acknowledgments & concluding remarks (Paul Sheppard)		
5:00-6:00	Course evaluation, completion of 2017 Presession Courses in Dendrochronology		
6:00-9:00	Celebration banquet, details pending		

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