



# L.W. Schatz Demonstration Tree Farm

## 2016 Annual Report

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### Carbon, Water-use, and Regeneration after Variable-density Retention in Evergreen Mixed-conifers

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Throughout 2016, faculty and students were busy planting, mapping and collecting data for the “Carbon, Water-use, and Regeneration after Variable-density Retention in Evergreen Mixed-conifers” project. This multi-year, collaborative project began in 2014 and is examining the impact of variable-density retention (VDR) in evergreen mixed-conifers on carbon storage, water use and regeneration.

Dr. Pascal Berrill’s team of student researchers continued to study the survival and growth of hundreds of redwood and Douglas-fir seedlings planted throughout the variable-density retention experiment. The team of four student research assistants was funded by McIntire-Stennis Cooperative Forestry grant money. Students in Dr. Christa Dagley’s Forest Management class planted additional seedlings along three of the up/downhill transects designed to create future research opportunities. These non-forestry students learned forestry surveying and mapping skills. In spring 2017 Dr. Berrill’s Forest Restoration class will perform manual release treatments to remove competition (significant hardwood and brush) in the vicinity of the planted seedlings. The class will also replant a dry ridgetop area which had poor survival of seedlings planted in 2015. These students will use



*Variable density thinning study site at the Tree Farm*

the seedling location data collected by the student research team to develop GIS stem location maps and collect data on competition in the vicinity of each seedling for regression analysis of competition effects.

Seed dispersal, germination rate and seedling survival were measured in 2016. Over the growing season (May – October), the water potential and stomatal conductance of saplings were measured by Dr. Lucy Kerhoulas, research assistants Nicholas Kerhoulas and Wade Polda and undergraduate assistants Gabriel Goff and Nicholas Kilgore. In spring 2016 the Silvics class measured height, basal diameter, water potential, and stomatal conductance on redwood and Douglas-fir seedlings. In the spring of 2017 all 90 saplings will be destructively harvested and will be analyzed for below- and aboveground biomass accu-

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## Carbon, Water-use, and Regeneration after Variable-density Retention in Evergreen Mixed-conifers (continued from page 1)



*Nick Kerhoulas measuring tree physiology of a bigleaf maple*



*Lucy Kerhoulas (and baby Camille) measuring stomatal conductance with a leaf porometer on a redwood seedling*

mulation. The data so far has led the researchers to hypothesize that harvesting saplings will show that redwood has greater belowground biomass accumulation compared to Douglas-fir.

Graduate student Hollie Ernest completed her Master's Thesis estimating the of below ground carbon pools at the study site. Soil organic carbon (SOC) to a depth of 1 m was estimated to be between 200,000 kg per hectare and 300,000 kg per hectare. The below ground carbon research findings were also presented at the California Forest Soils Council annual meeting. In the spring, Capstone students collected data and estimated carbon (C) held in understory vegetation, woody debris, litter and duff. Above ground carbon has also been mapped, with all trees in the treatment and control areas measured and stem mapped. Independent modeling by Dr. Aaron Hohl shows about 144,000 kg C per hectare in aboveground and belowground biomass averaged over the whole plot, with an assumption that approximately 49% of biomass is carbon.

Dr. Andrew Stubblefield and his graduate student Kirsten Reddy installed Douglas fir trees with sapflow probes in 2015. Individual Douglas fir tree water use measurements have been collected over 17 months. Analysis of water use with respect to tree size and stand density is underway. Soil moisture sensors have also been installed at the study site by graduate and undergraduate students. Soil moisture measurements have been made using sensors and surface samples and analysis is ongoing.

The project will wrap up in 2017 with additional monitoring of planted seedling growth and manual weed control to maintain the experiment. The data collected will be analyzed by the researched with the findings published and presented at meetings.



*Dr. Lucy Kerhoulas at the variable density study site*

## Research at the Tree Farm in 2016

### Bigleaf Maple Project

Dr. Lucy Kerhoulas began studying and quantifying epiphyte communities in bigleaf maple trees at the Tree Farm this past year. Three large, old bigleaf maples (*Acer macrophyllum*) were located on the Tree Farm property. The trees were climbed with physiological and morphological measurements collected during the 2016 growing season. The light levels and tree water potential were measured in the crowns of the maples. Stomatal conductance of the leaves were also measured in the field. Undergraduate Forestry students Gabriel Goff and Nicholas Kilgore and research assistants Nicholas Kerhoulas and Wade Polda assisted with the field work. In the lab a variety of leaf properties were measured as well. This included leaf photosynthesis, respiration, stomatal conductance, internal CO<sub>2</sub> conductance, light saturation point, and light compensation point. Undergraduate Arielle Weisgrau assisted with lab work. The data will be analyzed and presented in 2017.



Nick Kerhoulas climbing a bigleaf maple to measure tree physiology at the Tree Farm



Graduate student Walter Kast excavates of 2010-planted Douglas-fir at the Tree Farm.

### Root:Shoot Biomass

Graduate student Walter Kast and his adviser Dr. Pascal Berrill continued to excavate and study root biomass in young conifer seedlings planted by FOR 432 Silviculture students in 2009 and 2010. With the help of the Tree Farm Summer Crew, Walter excavated another set of redwoods, Douglas-firs, and grand firs providing him his largest and oldest sample trees. This experiment has involved three Tree Farm Summer crews, including the crew that Walter himself worked on as an undergraduate when this root biomass study was initiated. In September 2016, Walter and Pascal presented a poster at the Redwood Science Symposium in Eureka, CA showing predictive below-ground models of tree root biomass and root carbon predicted from easily-obtainable stem diameter measurements.

## Summer Operations and Maintenance in 2016

The summer crew completed significant maintenance and improvement projects throughout the property. Forestry students, Gabe Goff and Nick Kilgore, were the 2016 summer maintenance crew under the supervision of Gordon Schatz, Tree Farm Manager.

General maintenance of the facility was conducted including mowing, landscaping of the surrounding area. Vegetation was pruned and brush removed along roadsides to improve visibility and annual equipment maintenance was performed. In addition to performing maintenance and improvements, the Tree Farm crew provided assistance to several research projects over the summer.

## Tree Farm as a Classroom

### **SOIL 461: Forest Soils Capstone**

Capstone students produced a “A Snapshot of Carbon Pools at Schatz Tree Farm” in which they quantified the carbon in kilograms per hectare for the understory vegetation, woody debris, and litter and duff layers. Three groups of students. Samples were collected on site and sent to Oregon State University Central Analytical Laboratory for carbon and nitrogen analysis.

### **FOR 331: Silvics, FOR 315: Forest Restoration**

The Silvics class measured basal diameter, height, water potential and stomatal conductance on redwood and Douglas-fir saplings in the Variable Density Thinning treatment. Students in Forest Restoration planted and mapped additional seedlings in the experiment.



### **Senior Thesis (Biology)**

Biology undergraduate Wade Polda helped with field work on the Schatz Carbon project from July 2015 through October 2016. Wade conducted a preliminary analysis and wrote up the data for his senior thesis in Biology. Wade graduated from HSU in May 2016 with a BS in Botany.

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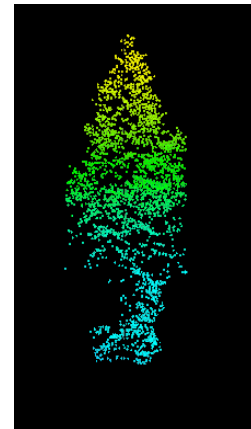
## Research Projects Anticipated for 2017

### **Small Mammal Inventory: the Sonoma tree vole**

Dr. Lucy Kerhoulas and Nicholas Kerhoulas will begin work on a Sonoma tree vole survey. The Sonoma tree vole is a small (mouse size) rodent that feeds almost exclusively on conifer needles and cambium. With habitat loss threatening their perseverance, the Sonoma tree vole is a California species of special concern. As part of a Master's thesis in 2003, a Sonoma tree vole survey at the Tree Farm found a total of 103 nests (23 confirmed active) in 86 trees. This research will resurvey the 86 trees that had vole nests in 2003. The resurvey will deepen the understanding of tree vole colonization and nest persistence in young second-growth forests. In addition to the resurvey, permanent survey transects at the Tree Farm will be established for long-term inventory of vole activity and density both from the ground and via tree climbing.

### **L.W. Schatz Tree Farm Carbon Inventory**

Dr. Harold Zald will quantify and map the aboveground live carbon (ALC) for the entire Tree Farm. ALC will be quantified using existing inventory plots and Light Detection and Ranging Data (LiDAR) data. The data includes 64 georeferenced inventory plots measured during the summer of 2006 and LiDAR data from 2009 that was provided by Green Diamond Resource Company. Species-specific allometric equations will be used to calculate aboveground live biomass (AGB) for all individual trees. During the summer of 2017 Dr. Zald will work with the Tree Farm field crew to update the locations of the inventory plots using Trimble GPS units, and remeasure all the inventory plots.



### **Expanding the Variable-Density Retention Study**

Dr. Pascal Berrill will be implementing additional Variable-density retention (VDR) replicates at the Tree Farm. The goal of this research is to implement a second replicate of the VDR experiment at the Tree Farm that includes substantial, meaningful student involvement. One to two replicates (1.5 ac each) of the VDR experiment will be implemented and monitored. There will be a combination of class field exercises (surveying, marking, tree planting), volunteer internship (chainsaw safety and tree falling clinics), and wage work (research-grade measurements) for students throughout the project.

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### **Contact Information**

#### **L.W. Schatz Demonstration Tree Farm**

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### **L.W. Schatz Demonstration Tree Farm**

The L.W. Schatz Demonstration Tree Farm's mission is to provide a demonstration tree farm operation for the benefit of the students and faculty of Humboldt State University and as an example for owners of small timberland parcels. The Tree Farm enables experimentation and research regarding the growing, harvesting, and replacement of trees on timberland. The Tree Farm aims to utilize as many square feet as practical for production of commercial wood crops. The Tree Farm serves as an outdoor classroom for educational purposes and also enables public educational assistance to landowners through publications, photos, lectures, symposia, and tours.



### **Department of Forestry & Wildland Resources**

#### **Tree Farm Advisory Committee**

David Greene, Chair, Department of  
Forestry and Wildland Resources

Rick Zechman, Associate Dean, Col-  
lege of Natural Resources and Scienc-  
es

Pascal Berrill, Assistant Professor, De-  
partment of Forestry and Wildland  
Resources

#### **Tree Farm Staff**

Gordon Schatz, Tree Farm Manager  
George Pease, Technician  
Sara Hanna, Research Associate and  
Coordinator

Gabe Goff, summer crew  
Nicholas Kilgore, summer crew

#### **Department of Forestry & Wildland Resources Faculty**

Pascal Berrill  
David Greene  
Han-Sup Han  
Jeff Kane  
Erin Kelly  
Lucy Kerhoulas  
Susan Marshall  
Stephen Sillett  
Andrew Stubblefield  
Harold Zald