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## Chapter 2: Vegetation Module

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### Forest Restoration in the Northern Sierra Nevada: Impacts on Structure, Fire Climate, and Ecosystem Resilience.

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#### Objectives

The vegetation module of the Plumas-Lassen Administrative Study studies how changes in the forest canopy affect ecosystem functioning, including microclimate, tree growth, understory diversity and competition of shrubs and juvenile trees. The module objectives are:

- 1) determine the effects of reduction in tree canopy cover on microclimate, fuels dryness, and other factors contributing to flammability of the forest understory, and**
- 2) determine effects of reduction in tree canopy cover on light, soil moisture, and other factors influencing composition and growth of the understory plant community.**

Research approaches include stand-level experimental manipulations, measurement of plant growth and survival along existing environmental gradients, and assessment of impacts of routine (i.e., non-experimental) forest management activities.

#### Research Activities 2006

*Study on Effects of Experimental Thinning and Group Selection on Forest Structure, Fire Climate, and Plant Communities in West-Side Mixed-Conifer Forest.*

The forest management treatments for this study are scheduled for summer 2007. In 2006, we continued to collect pre-treatment data in the nine 22-acre and three 2-acre

plots. Data relevant to fire climate included 1) continuous monitoring of windspeed, air temperature, and humidity and 2) monthly monitoring of moisture in duff and 1000-, 100-, and 10-hr activity fuels (**Fig. 1**). Data relevant to plant community dynamics include soil temperature (2 cm below mineral soil surface) and soil wetness in the 0 - 15 cm, 15 - 40 cm, and 40 - 70 cm horizons.

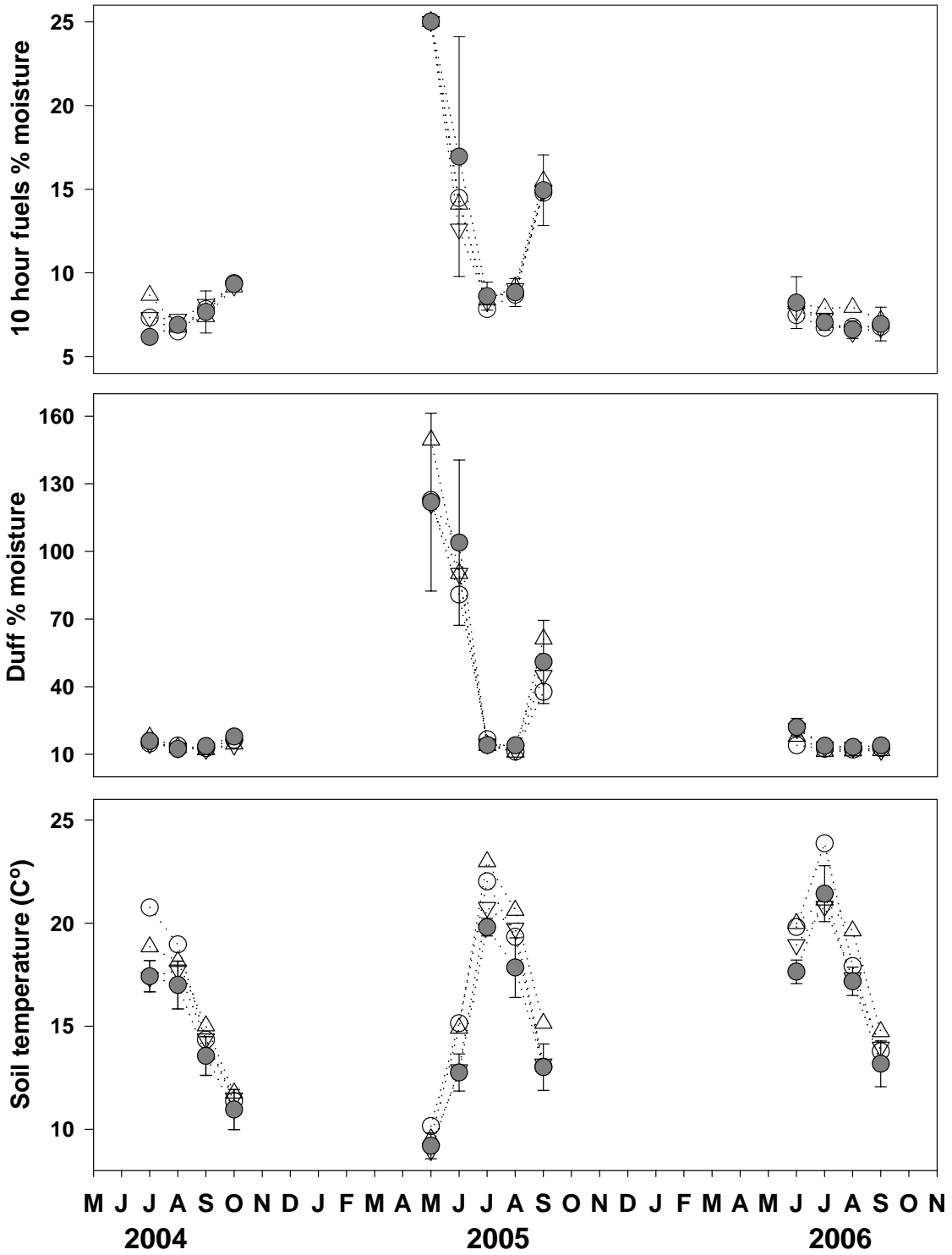
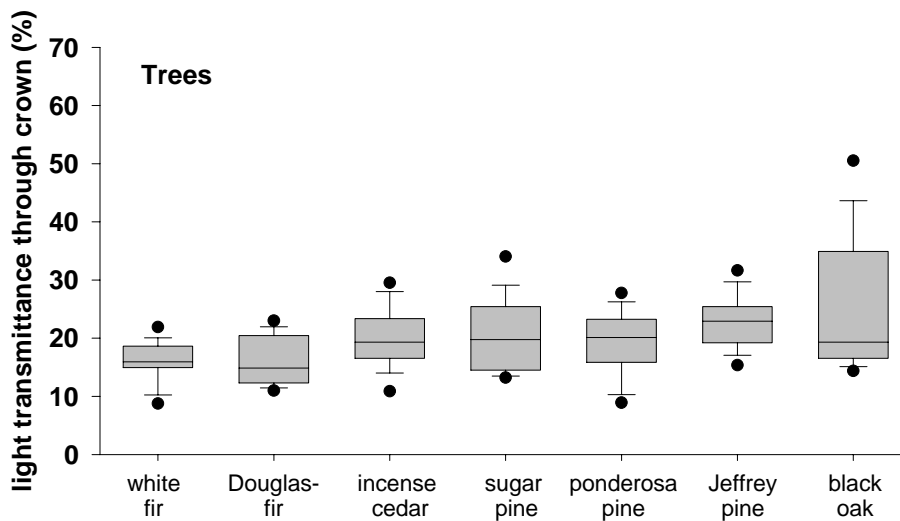


Figure 1. Seasonal trends in 10-hr fuel moisture, duff moisture, and soil temperature in experimental thinning plots prior to treatment. Open circle is group selection, downward triangle 30% canopy, upward triangle 50% canopy, and dark circle is control.

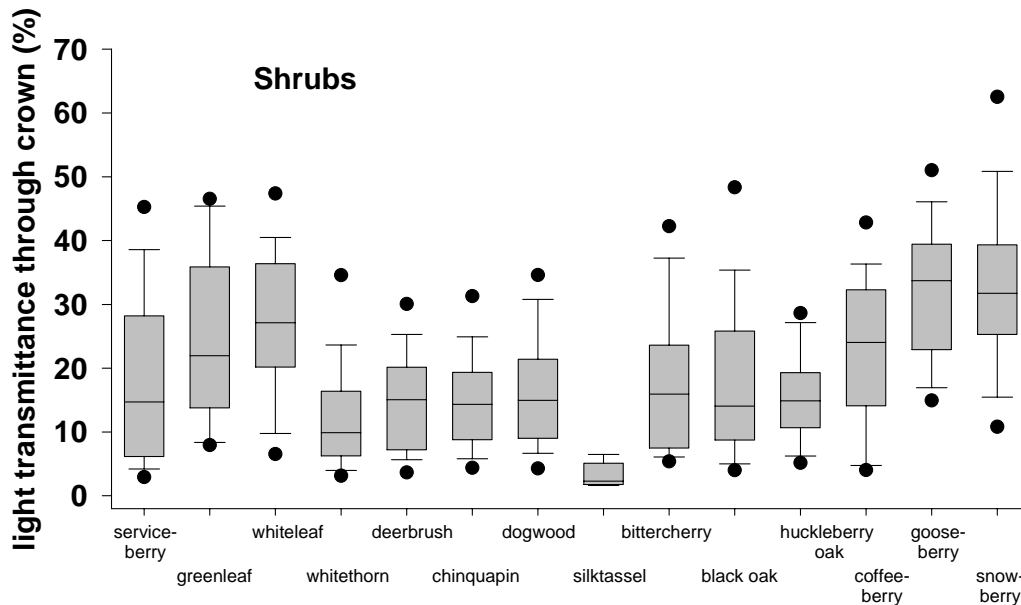
*Study on light transmittance in treated stands*

Availability of light in the understory is a major determinant of plant community dynamics, and understory light is expected to increase immediately after treatments are done. Before-and-after comparisons will be done on understory light measured with canopy photography. In 2006 we calibrated the canopy photography light estimates by measuring light with quantum sensors throughout the season in the same places where some of the canopy photographs were taken. We also measured light transmission through the canopy of mature trees (**Fig. 2**) and shrubs (**Fig. 3**). These parameters will go into an existing computer model that will allow precise prediction of understory light in spatially mapped tree stands. Data collected in our treatment stands will allow determination of the predictive accuracy of the light model.



**Figure 2. Light transmittance through crowns of canopy trees of the mixed-conifer community: transmittance increases as shade-intolerance increases.**

*Studies on performance of mixed-conifer saplings with respect to light and other factors (Seth Bigelow, Carl Salk, and Malcolm North).* The fourth census of the 500 saplings in this study took place this season. Although the extremely low mortality rates of these saplings over the past 4 years will make it difficult to estimate mortality with respect to light availability, annual height measurements will allow accurate estimate of height growth with respect to light.



**Figure 3. Light transmittance through crowns of common Sierran shrubs. Many shrubs are capable of casting extremely dense shade (= low light transmittance).**

### Outreach, Training, and Safety

#### *Outreach*

Vegetation module personnel gave a public presentation on their work at the 2006 Plumas-Lassen study symposium.

#### *Training and Personnel Development*

Seth Bigelow participated in a workshop on use of the R statistics and programming language for ecological studies. Keith Perchemlides completed a course for certification as a Wilderness First Responder.

#### *Safety*

The vegetation module's field technician developed an allergy to bee stings, which necessitated several trips to the emergency room.