# Abstracts

Swanson


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## Legacies, Landscapes and Limits: Bridging Borders

CHEN, H., M. E. HARMON, and S. GARMAN. Oregon State University, Corvallis, OR 97331 USA. **Modeling the effects of substrate quality, temperature, and moisture on root decomposition: implications for climate change.**

A root decomposition simulation model (ROOTDK) was developed to examine the effects of substrate quality, temperature, and moisture on woody root decomposition at three coniferous forests at Cascade Head (CAH), H. J. Andrews (HJA), and Pringle Falls (PRF) sites in the Pacific Northwest. Decomposition of woody roots of five species was simulated under current climate. Douglas-fir was used to test the impacts of four climate change scenarios on root decomposition at the three sites. The model captured the overall mass loss pattern of Sitka spruce, Douglas-fir, and western hemlock at HJA under the current climate. In contrast, the model predictions systematically underestimated root decomposition of western hemlock at CAH, ponderosa pine, and lodgepole pine at PRF. After simulating Douglas-fir root decomposition under changed climate, predictions indicate that woody root decomposition at CAH and PRF was more sensitive to possible climatic changes than HJA. Current conditions are evidently too moist at CAH and too cold and dry at PRF. In contrast, soil temperature and soil moisture regimes at HJA was more optimal for root decomposition, even under the changed climate. Thus, even within one region the responses of root decomposition to altered climate can be divergent, with some sites increasing, other decreasing, and other remaining relatively unchanged.

CHEN, H. Y. Ontario Ministry of Natural Resources, South Porcupine, ON P0N 1H0 Canada. **Effects of overstory productivity and soil nutrient availability on understory vegetation in trembling aspen ecosystems.**

We examined the relationships between cover and richness of understory vegetation, overstory productivity, and soil nutrient availability in fire-originated trembling aspen (*Populus tremuloides*) ecosystems of northern British Columbia. Sixty 0.04-ha (20 x 20 m) plots, deliberately located to represent the widest range of site conditions that support aspen growth, were investigated for understory species and their covers, overstory basal area, and site index. Forest floor and mineral soil (0–30 cm in depth) samples were analyzed for pH and total N concentration. Soil nutrient availability was also assessed according to topography and soil morphological properties. The relationships greatly varied among plant structural groups. With increasing overstory basal area, site index, and soil nutrient availability, the cover and richness of herbs strongly increased, whereas those of mosses decreased. Shrubs tended to have a higher cover but a lower richness on poorer sites, whereas the cover and richness of tree seedlings were related to neither overstory productivity nor soil nutrient availability. When all structural groups were combined, species richness increased with overstory productivity and soil nutrient availability, but there was no clear relationship between the cover of all understory plants and overstory productivity or soil nutrient availability.

CHEN, X., L. T. WILSON, and R. D. WEEKS. Texas A & M University, College Station, TX 77843-2475 USA. **Dynamics of colony growth and population expansion of imported red fire ants.**

To investigate the colony and field level dynamics of imported fire ants, an analytical model was built and analyzed. The model contains two state variables: the average size and density of ant colonies. The two variable is couple via nonlinear density dependent feedback. The equilibrium of the system is set either by the resource availability or by the demographic constraints. In a constant and homogeneous habitat, the resource availability is always the constraint in operation. Increasing resource availability tends to have a larger impact on the average size of colonies than on the density of colonies. The dynamics of the model and their implications are discussed.

CHRISTENSEN[1], L., R. M. REICH,[2] J. E. ELLIS,[1] M. B. COUGHENOUR,[1] and K. PRICE[3]. [1]Natural Resource Ecology Laboratory, CSU, CO 80523 USA; [2]Colorado State University, CO 80523 USA; [3]Kansas Applied Remote Sensing Program, KS 66045 USA. **The importance of testing for spatial autocorrelation in ecological studies.**

The objective of this study was to show the significance of testing for spatial autocorrelation in ecological studies. Studies at the landscape scale may include areas that contain spatial patterns within the study area. The presence of spatial autocorrelation can have three effects on statistical analysis: No significance when in fact it exists, significance when there is not significance, or no effect at all. If these effects are not accounted for, results from statistical analyses can be misleading. We looked at the trend of plant biomass over time, using the Normalized Difference Vegetation Index (NDVI) as an indication of vegetation aboveground biomass (with the effect of precipitation removed) over an 80 x 80 km area. Simple linear regression showed NDVI decreased over time ($r^2$=0.43, $P$<0.0001) where statistical analyses using model selectionshowed same results with a higher significance ($r^2$=0.89, $P$<0.0001). Results from spatial tests indicated that NDVI was spatially autocorrelated across the landscape and removal of spatial autocorrelation increased significance of the test ($r^2$=0.90, $P$<0.0001). In this case the presence of spatial autocorrelation resulted in decreased significance of the relationship between NDVI and time.

CITRON-POUSTY, S. I. University of Connecticut, Storrs, CT 06269 USA. **Settling dynamics in relation to environmental heterogeneity at several spatial scales for a terrestrial isopod.**

I studied the settling dynamics of the terrestrial isopod, *Hemilepistus reaumuri*, for three summers in the Negev Desert of Israel in four small first-order watersheds. Three spatial scales were examined, within slopes of a watershed, between slopes, and the watershed as a whole. Since water is the limiting element in the desert, factors that affect water balance will affect population dynamics. I used remote sensing from aerial photographs and hand spectroscopy to quantify spatial heterogeneity. Dew duration was sampled using 20 sensors facing eight different directions at different elevations. I used geostatistics and point pattern analysis to investigate the pattern of isopod settlement. Maps of burrows show areas of the slope consistently retaining high or low density of settlers. Point pattern analysis revealed burrow clustering at all spatial scales. The variograms showed a cluster size ranging from 15 to 30 m depending on watershed and year. At the scale of entire watersheds the density of burrows is correlated with the direction in which the watershed opens. These results lead to several conclusions. (1) Within slopes, the isopods respond to rainfall runoff dynamics. (2) Between slopes, the overall pattern of rainfall redistribution drives dynamics. (3) At the watershed scale, the settling pattern is related to total water balance.

CLARK, K. L., H. L. GHOLZ, S. M. SMITHERMAN, C. SUN, and D. J. GOLUB. **Environmental controls over net $CO_2$ exchange across a chronosequence of slash pine forests in north Florida.**

To understand the effects of forest management on regional C balances in slash pine (*Pinus elliottii*) flatwoods, we measured net $CO_2$ exchange with the atmosphere using eddy covariance over a recent clearcut, two 10-yr-old stands, and a 24-yr-old (rotation aged) stand. Daytime net $CO_2$ exchange was not significantly different from zero at the clearcut, and was a curvilinear function of incident radiation at the 10-yr- and 24-yr-old stands ($r^2$ = 0.70 and 0.65, respectively). Mean maximum daytime rates were similar at the 10-yr- and 24-yr-old sites (-17 and -15 μmol $CO_2$ $m^{-2}$ $s^{-1}$ at 1500 μmol PAR $m^{-2}$ $s^{-1}$), reflecting the similar leaf areas of these stands. Nighttime net $CO_2$ exchange was an exponential function of air temperature at all sites; mean rates at 25°C were 4, 4, and 5 μmol $CO_2$ $m^{-2}$ $s^{-1}$ at the clearcut, 10-yr-old, and 24-yr-old sites, respectively. Lack of differences in nighttime net $CO_2$ exchange rates among sites results from the low decomposition rates of litter and slash following stem-only harvest, and later from the low biomass in developing stands. We integrate net $CO_2$ exchange data with forest inventories, Landsat images and meteorological data to estimate regional C balances for pine flatwoods in north central Florida.

CLAUSS, M. J. University of Arizona, Tucson, AZ 85721 USA. **The role of the seed bank in population dynamics of a desert annual plant: a multi-year study in four populations of *Plantago insularis*.**

The population dynamics of annual plants with persistent seed banks are determined by the fate of both germinated seedlings and non-germinated seeds and by the proportion of individuals germinating. I investigated the relative impact of germinating versus not germinating on population growth in four populations of the desert annual *Plantago insularis* in four years. On forty permanent plots per population, germinated seedlings were uniquely identified and followed throughout development. Survival to reproduction and fe