Abstracts

The Ecological Society of America

84th Annual Meeting

Riverpark Convention Center
Spokane, Washington
August 8–12, 1999

Legacies, Landscapes and Limits: Bridging Borders

PRICE, K. P., X. GUO, and J. M. STILES. University of Kansas, Lawrence, KS 66045 USA. **Discrimination of six grassland management practices using merged Landsat TM and ERS-2 SAR data.**

Tallgrass prairies of North America are among the most biologically diverse grasslands in the world. The various management practices associated with these lands can have significant impacts upon their plant and animal communities. Soil stability and other hydrologic factors are also affected by grassland utilization practices. This study examines effects of land management practices on spectral characteristics of grasslands within a tallgrass prairie ecosystem in Eastern Kansas. To assess the grassland spectral properties, we acquired three dates (May, July, September) of Landsat Thematic Mapper (TM) imagery and four dates (May, June, September, and October) of ERS-2 Synthetic Aperture Radar (SAR) data in 1997. Field data (biomass, plant height, cover, and species composition) were collected from 73 grassland sites selected to represent three management practices (haying, grazing, Conservation Reserve Program (CRP) lands) on C_3 (cool season) and C_4 (warm season) grass types. The three dates of TM and four SAR imagery were merged to create a single data file from which pixel samples for each study sites were extracted and statistically analyzed. Results of this analysis indicated that use of multi-temporal TM data for discriminating among grassland management practices has a distinct advantage over the use of single-date imagery. Radar data alone were less accurate than TM for discriminating the grassland types, but when merged with TM, some improvement in overall classification accuracy was achieved.

PRINGLE, C. M. University of Georgia, Athens, GA 30602-2602 USA. **Understanding hydrologic connectivity in complex landscapes: Implications for the design and manangement of reserves.**

As landscapes have become increasingly fragmented, so have hydrologic systems. However, management of hydrologic connectivity on a landscape scale has often been ignored by both conservation biologists and resource managers alike. Most of the theoretical underpinning of the conservation biology of fragmented landscapes was developed under a conceptual model of landscapes that were not yet entirely fragmented, and when the science of riverine connectivity was in its infancy. This helps to explain why the subject of "water" is often excluded from the literature that pertains to both theoretical and practical aspects of reserve size, isolation, and design. Obvious influences which disrupt hydrologic connectivity and often result in cascading effects throughout both aquatic and terrestrial ecosystems include: dams; channelization; water diversions and/or abstraction from the stream channel or groundwater. Such disturbances are transmitted downstream, upstream, laterally, and vertically, often with significant time lags that make quantification of their effects difficult. Here I examine strategies for management of hydrologic connectivity in fragmented landscapes for the protection of ecological values. Case studies illustrate the vulnerability of biological reserves in different regions of the world to alterations of hydrologic connectivity on both local and regional scales, regardless of differences in reserve size, climate, geology, and ecology. Hydrologic connectivity of reserves with the surrounding landscape plays a major role in determining how biotic resources (contained in reserves) respond to both human-induced and natural disturbance.

PRITCHARD, S. G.,[1] S. A. PRIOR,[1] R. J. MITCHELL,[2] G. B. RUNION,[3] and H. H. ROGERS.[1] [1]USDA-ARS National Soil Dynamics Laboratory, Auburn, Al 36832 USA; [2]Joseph Jones Ecological Research Center, Newton, GA 31770 USA; [3]International Paper, Bainbridge, GA 31717 USA. **Response of a model regenerating longleaf pine community to atmospheric CO_2 enrichment: growth and morphology.**

Model plant communities of intermediate complexity are useful to determine the influence of rising global CO_2 levels on specific processes underlying ecosystem form and function. Therefore, five common associates of natural regenerating longleaf pine communities, representing different plant functional types, were planted in the ground at densities reflective of nature: longleaf pine, wiregrass (C_4), sand post oak, rattlebox (C_3) perennial herbaceous legume), and butterfly weed. Twelve open-top chambers were installed representing both ambient (360 µmol/mol) and elevated CO_2 (720 µmol/mol) concentrations. Exposure to elevated CO_2 did not significantly alter growth or morphology of oak or wiregrass sampled 4 mo after treatment initiation. Rattlebox plants grown in elevated CO_2 had 23% more runners, but the area creased, suggesting thicker leaves. Longleaf pine exhibited the greatest growth stimulation of all species: 23% greater fascicle number, 25% greater leaf area per needle, 22% more needles per plant, 52% greater leaf area per plant, and 54% greater leaf dry mass per plant 4 mo after treatment initiation. Results obtained after 4 mo are compared to data obtained 1 yr later to determine if response patterns will change with increasing duration of exposure to elevated CO_2.

PRUYN, M. L., B. L. GARTNER, and M. HARMON. Oregon State University, Corvallis, OR 97331-7402 USA. **Patterns of metabolic activity within the sapwood of Douglas-fir (*Pseudotsuga menziesii*, [Mirb.]).**

Sapwood (SW) serves many key functions in woody plants, but the physiological mechanisms controlling its volume and composition are poorly understood. We hypothesize that mechanic, hydraulic, and metabolic mechanisms all control SW morphology. We also suggest that there are trade-offs among these mechanisms that enhance species acclimation and survival. We examined metabolic activity in six 100+ yr-old Douglas-fir (*Pseudotsuga menziesii* (Mirb.)) trees. Cores were removed from the stem's base, at 1 m and at 35- and 15-yr-old nodes. Each core was divided into inner bark (IB), outer, middle, inner SW, and heartwood (HW). A gas chromatograph was used to measure CO_2 evolution from each sample in µmol/g dry mass/h. CO_2 release increased with respect to horizontal position from the pith. The HW was the least active tissue, releasing no CO_2. Inner and middle SW released an average of 40% the CO_2 released in outer SW, which released 27% the CO_2 released in IB. The lowest activity along the stem was at 1 m, where IB tissues released 70% the CO_2 released at the base and 30% that released at node 15. SW at 1 m released an average of 80% of the CO_2 released at the base and 50% of that released at node 15. This potential increase in metabolic activity near the stem roots, tips, and IB suggests that tissues near carbohydrate sources have higher metabolic activity.

PURUCKER, S. T. University of Tennessee, Knoxville, TN 37996 USA. **Dose rate variability from chronic ^{90}Sr exposures to white-tailed deer (*Odocoileus virginianus*) in Melton Valley, Tennessee.**

Past waste management practices have resulted in the presence of radioactive contamination in Melton Valley of the White Oak Creek watershed in Oak Ridge, Tennessee. Strontium-90 (^{90}Sr) is one of the major radionuclides of concern in this area due to the amount disposed, its solubility, and its fate once it enters the mammalian body. Bio-accumulation of ^{90}Sr in white-tailed deer (*Odocoileus virginianus*) create the potential for individual mortality, reproductive effects, and growth inhibition. Once in a mammalian body, ^{90}Sr initially is dispersed among soft tissues; however, as much as 90–98% of the total body burden is eventually fixed in mineral bone. Internal doses received by an individual may increase with age due to the fixation in bone and the long half-life of ^{90}Sr (29.6 yr) relative to the life expectancy of the white-tailed deer. This study investigates the variability in ^{90}Sr-related dose exposures for white-tailed deer using a stochastic approach. Physiologically structured exposure models were employed to calculate the internal doses over time for different internal compartments of the deer. Compartments that were tracked include bone marrow, bone surface, gonads, and other internal organs. The resulting dose distribution was compared to the generally accepted dose limit of 1 rad/d to assess the potential for adverse effects on white-tailed deer.

PYKE, D. A.,[1] P. H. SMITH,[2] J. M. PATTERSON,[3] J. F. HENSON,[4] and S. D. WARREN.[5] [1]USGS, Forest & Rangeland Ecosystem Science Center, Corvallis, OR 97331 USA; [2]USDA, Natural Resources Conservation Service, Fort Collins, CO 80526 USA; [3]USDA, Natural Resources Conservation Service, Lincoln, NE 68508 USA; [4]USDA, Natural Resources Conservation Service, Baton Rouge, LA 70874 USA; [5] Colorado State University, Fort Collins, CO 80523 USA. **VegSpec: a revegetation tool for land managers.**

Land managers are often faced with difficult decisions on how to use plants in solving land management problems. Managers must decide the appropriate species and techniques to establish plants for revegetation, reclamation, or restoration of plant communities. VegSpec is a World Wide Web-based expert system developed to help land managers in selecting and planning revegetation projects. Using a series of species selection rules relating to the climate, soils, and specific uses, the VegSpec program queries three databases to match adapted plants with the specific site conditions. The three databases are: (1) the NRCS currently published soil surveys for all 50 states; (2) long-term