Abstracts

The Ecological Society of America
84th Annual Meeting

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

Legacies, Landscapes and Limits: Bridging Borders

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on a plant (joules), THETA is the energy cost of search (joules/m), and *w* is the width of a feeding station (m). In patchy environments, there is an optimum scale of search (L_{opt}) yielding maximum net energy gain, $L_{opt}=\exp(\ln(\text{EPSILON} * w\ d)/(2-d))$. (2) If the animal searches at scales exceeding this optimum, energy returns decline until costs of search increasingly exceed gains. These relationships have important implications for understanding foraging behavior of herbivores and for evaluating suitability of their habitats. In particular, we show that maintaining positive energy balance requires that herbivores adjust their foraging time and velocity to respond to heterogeneity at multiple scales.

HODNETT, K., and M. L. REID. University of Calgary, Calgary, AB T2N 1N4 Canada. **Settlement strategies of the pine engraver *Ips pini*: Costs and benefits of joining breeding aggregations.**

Breeding in aggregations has substantial costs associated with being in close proximity with conspecifics. The pine engraver bark beetle forms breeding aggregations and suffers costs in number of offspring produced as density of the aggregation increases. Research in the Kananaskis Valley, Alberta, investigates how individual condition can affect an individual's ability to attract mates. Males unable to attract their own mates may adopt alternative settlement strategies. The rate of mate attraction per male within aggregations and for lone settlers was examined over two summers. Within aggregations, individual choice of nearest neighbours was also determined. My results suggest that poor quality males attract mates at a slower rate than competing high quality males, and are unlikely to attract their own mates when they settle on an uninhabited log. This results in low quality males settling near attractive males, creating the aggregations we observe. Conversely, males able to attract mates benefit from settling on uninhabited logs in order to reduce intraspecific competition.

HOFFA, E. A ., M. E. HARMON, S. REMILLARD, and S. A. ACKER. Oregon State University, Corvallis, OR 97331 USA. **Potential upper bounds of carbon stores in the Pacific Northwest.**

Forests in the Pacific Northwest are among the world's largest and thus can be used to set an upper bound on carbon stores. We sampled 50 permanent plots in old-growth stages over the entire range of productivity within the region to determine the amount of carbon stored in living vegetation, detritus, and soils to a depth of 1 m. Coastal *Tsuga heterophylla–Picea sitchensis* ecosystems were highest storing 1100 Mg C/ha, whereas *Pinus ponderosa* east of the cascade crest were lowest storing an average of 150 Mg C/ha. *Pseudotsuga menzsiesii–Tsuga heterophylla* dominated ecosystems were highly variable, but stored an average of 600 Mg C/ha. These differences reflect previous findings on the range in forest productivity within the Pacific Northwest. Trees are the largest pool over the entire productivity gradient, comprising 55–65% of the total stores. Soils (excluding organic horizons) are next in importance (15–30% of total), whereas detritus is lowest (10–20%). The average maximum for the region, weighted by productivity level, is ~610 Mg C/ha, which is among the highest reported in the globe.

HOLDER, T., and E. WEIHER. Mississippi State University, Mississippi State, MS 39762 USA. **Structural and functional stability of gulf coastal dune vegetation to hurricane disturbance and soil fertilization.**

Along the gulf coast, hurricane disturbance is a nearly annual phenomenon (e.g., Aug. 1995, Oct. 1995, 1997, 1998). Sand dune vegetation is critical habitat for the granivorous, endangered Alabama beach mouse. We have been investigating the effects of fertilization (in six 120 x 240 m treatment plots) as a restoration tool (in terms of vegetation cover and seed production), and the most recent hurricane provided us an opportunity to assess the relationships between prehurricane community properties (percent cover, species richness) and aspects of functional and structural stability: change in vegetation cover, change in winter seed production, and change in plant community composition. We also assessed whether fertilized dunes were more stable than unfertilized dunes. Floristic diversity was not significantly related with the resilience of vegetation cover 3 mo posthurricane. A small number of quadrats (10 m^2) increased in cover, but these had a wide range of predisturbance richness. As expected, scrub dunes (with evergreen oaks) were most resistant. Prehurricane cover and fertilization had no effect on the change in species richness; quadrats lost 44% of species on average. Preliminary results suggest that changes in winter seed production were independent of species richness and cover. These results suggest that there is no linkage between functional stability and diversity in coastal dunes.

HOLMES, Z., L. VERCHOT, and P. GROFFMAN. S
Tuskegee University, Tuskegee, AL 36088 USA. **Assessin
three methods on three tree species.**

Since nitrogen (N) is frequently limiting to the productivity
tems, differences in the rates of nitrification can have a p
primary productivity. However, the lack of a suitable met
this N transformation has sometimes restricted it from beir
other ecosystem processes. The purpose of this study was
different methods of measuring nitrification on three diffe
plots. The methods compared included a laboratory based in
a field based incubation method, and a shaken soil-slurry
measures nitrification potential). The species used for the
sugar maple (*Acer saccharum*), American beech (*Fagus gra*
oak (*Quercus rubra*) stands in the Catskill Mountains. Tv
were chosen for each species and four field replicates wer
each plot. Mineral soil and forest floor were separated befc
analyzed. Results showed that there were significant ($P < 0.($
between the species plots when the laboratory incubation n
There were also significant ($P < 0.0001$) differences observe
the field incubation method and the shaken soil-slurry methc
tistical significance of the species difference was higher for
slurry methods than for the field incubation method. The st
tween the values given for the nitrification rate was also m
the values for the field incubation method. Therefore, the sl
method proved to be the most suitable method for the compa
fication rate between the species.

HOOKER, T. D., and J. E. COMPTON. University of Rhode
RI 2881 USA. **Changes in post-abandonment quantity an
organic matter C and N contents over 114 yr in a white pine c**

Historical land use affects the quantity and quality of orga
long after agricultural abandonment. We developed a chrono
viously plowed sites varying from 10 to 114 yr after abandon
gate changes in soil organic matter pools during reforestation
England. Sites were located on well-drained till soils, while the o
tion was restricted to white pine (*Pinus strobus*) dominated fores
plowed (> 50 yr) and nonplowed sites, with white pine also pr
old-field sites. We found no relationship in 0–15 cm mineral so
content with time since abandonment or historical land use.
organic matter content of plowed sites increased with site a
Mg/ha, and was similar to nonplowed sites 75 yr after aba
mineral soil C:N ratio in the plowed sites increased linearly w
to 23, but remained lower than nonplowed soils (28) after 11
tionship was driven largely by the decreasing N concentratio
matter with time since abandonment. The decrease in N concen
due to lower quality organic matter inputs, uptake and storage by
ass, leaching losses, or movement deeper within the solum. The
of soil organic matter after abandonment, and the factors that co
could affect long-term N cycling and organic matter retention pr

HORNER, M. Central Washington University, Ellensburg, W
**Numbers of cavity-nesting birds in relation to snag dens
stand replacement fire and salvage logging.**

The objectives of this study were to determine the optimum nu
that would support the highest number of cavity nesting birds
areas that had experienced stand replacement fire and prescrib
ging. Since snags are a limiting resource for nest and roost sites fo
it is hypothesized that more snags will allow for a higher abun
nesters. Three treatment levels of snags were examined; high densi
ha, medium density, 15–35 snags/ha, and low density, 0–12 snags/
of ~36 ha each were studied for each treatment. Bird abunda
lished using a fixed point count method. Snag characteristics
dbh were determined by multiple snag surveys that were cond
center of each point count station. Trees < 6cm dbh were simp
liminary results suggest that the number of cavity nesting bir
cantly higher in the medium snag density plots. In addition, spe
cavity nesters was highest in the medium snag density plots with
The indices from low and high snag density plots were 6.84 an
tively. Results may be indicative of the intermediate disturbanc