

## Progress Report – Boone

### Nitrogen Mineralization Studies

#### *Bonanza Floodplain Successional Sequence*

The net N mineralization buried-bag study together with examination of extractable amino acids and proteins for the Bonanza floodplain successional sequence was completed this year. We now have an annual record of net N mineralization (0-10 cm soil depth) for all major successional stages (willow, alder, poplar, white spruce, and black spruce). To our knowledge these are the first net N mineralization data for the entire BNZ floodplain successional sequence based on a common method and for the same soil profile slice. They show (1) a progressive rise in net N mineralization (per gram soil) up to the white spruce stage and a decline in black spruce, (2) significant net nitrification in the alder stage only, (3) relatively higher extractable nitrate (though at low levels) in the black spruce stage than in the others, and (4) high levels of extractable amino acids and proteins relative to inorganic N. Extractable amino acids were 2-5 times higher and extractable proteins were up to 100 times higher than inorganic N. Unlike net N mineralization, which peaked in the white spruce stage, extractable amino acid and protein concentrations rose progressively across the successional sequence with highest levels in the black spruce. This pattern paralleled by increases in protease activity support the view that plant uptake of organic N becomes dominant in the later successional stages.

Rich Brenner completed his field studies of N dynamics in N-fertilized and control balsam poplar and white spruce stands on the floodplain. Net N mineralization for both stand types was 50% higher on average in the N fertilized plots relative to controls. The white spruce showed no fertilization effect on nitrification, whereas almost all the increase in net N mineralization in the balsam poplar was reflected by an equivalent increase in net nitrification. Brenner has completed all field and laboratory analyses for his measurements of gross N mineralization on the same plots.

Susanne Trillhose completed a 1-yr study of net N mineralization in black spruce and hardwood plots (burned and control) in the FROSTFIRE burn area at CPRW. The burn had variable effect on net N mineralization in the hardwood stands and generally had a stimulatory effect in the black spruce stands. With perhaps one exception, net N mineralization rates at all sites were negative or essentially zero in June when soil temperatures are still quite low. In the mineral soil the 0-5 cm depth interval had proportionally higher net N mineralization than did the thicker 5-20 cm depth interval. Over-winter net N mineralization represented a large proportion of total annual net mineralization at all sites. Over the full 12 months the variable response in the hardwoods and the slight stimulation in the black spruce suggests that fire may only slightly increase net N mineralization on an area basis, if at all.