Microbial enzyme activities (MEA's) are measurements of microbial metabolism. These activities are dependent on the need for nutrients and respiration. This extended study evaluated four streams in the same watershed that had an approved forest clear cut Total Maximum Daily Load. Sediment and water samples were collected monthly for the first year of each specific stream study, and then quarterly to the end of 2006. Dehydrogenase, a measure of microbial respiration, along with acid phosphatase, alkaline phosphatase, galactosidase and glucosidase activities were monitored in the streams. Biochemical oxygen demand (BOD) was determined using the standard 5-day test for oxygen consumption using the phenolphthalein method. Inorganic nitrogen was measured using colorimetric procedures. Sediment MEA values were also determined using the standard procedures for the conversion of 

### MATERIALS AND METHODS

- Water samples were collected in pre-cleaned 2 liter PPE bottles and added to a test tube containing a specific buffer per procedure. Nitrates were determined following Hach procedures (Hach, 1999). Nitrates were determined using ultraviolet spectrophotometry. 
- The assays for MEA’s required one gram of sediment added to the specific test cell containing 50 ml of sample. 
- Dehydrogenase (DHA) was added to the sample, and the concentration in mg/L was determined.
- The assay was carried out using the specific procedure in Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, and WPCF. 2005. Washington, D.C.
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### RESULTS

#### Conclusions of Stream Enzyme Activities Parameters

- High significant correlations were noted between the BOD, nitrates and phosphates, as well as the specific parameters of AcidP, AlkP and Glu.
- Both positive and negative correlations (p<0.05 Pearson correlation) were noted between the specific parameters of AlkP and five enzymes and BOD, nitrates and phosphate concentrations. (Table 1)
- In the cooler winter months, found positive correlations between AcidP and AlkP and nitrates and phosphates. 
- Also in cooler months, Gal and Glu positively correlated with nitrates and phosphates.
- In the spring months, AcidP also positively correlated with nitrates and phosphates.
- In warmer summer, DHA, AcidP and Glu positively correlated with nitrates and phosphates. 
- Negative correlations were noted in the fall between Gal and Glu versus BOD and nitrates.

### CONCLUSIONS

Higher DHA values in the warmer summer months reflected greater microbial activity. (Figure 2) AcidP was found to positively correlate with the nitrates, phosphates, and BOD. In the colder winter months, significant positive correlation noted between AcidP, Gal and Glu versus the nitrates and phosphates. Concentrations of these enzymes in less biologically active forest environments might be due to higher enzyme activities during these warmer months.

**REFERENCES**

M. H. B. White. 1977. Evidence for microfloral succession on allochthonous sediment. Aquatic Microbial Ecology and Activity and phosphates. AcP activity is the most interesting in the discussion of microbial respiration and might be directly proportional to the BOD. 1989. American Society for Microbiology, Ada, OK.

- AcP activity and alkaline phosphatase (AlkP) activity are necessary for the conversion of organic phosphates to inorganic orthophosphates. Higher enzyme activities would reflect higher enzyme activities.
- Glucosidase (Gl) activity and nitrate activity (Glu) provide energy emerge from conversions of mannose and lactose. Superior values will be seen in the fall when the stream was compared to the spring. 

**OBJECTIVES**

- The objectives of this study were to: 1) compare the specific concentrations of MEA’s in the streams; 2) determine the inorganic phosphates in the four streams; 3) compare the four streams of the relationship between the quatemary of enzyme activities over each concentration of BOD, nitrates and phosphates, based on season. 

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