

## **Vegetation and Water Quality Summaries from 11\_06\_03 A-Team Meeting**

### **A Multi-year Synthesis Report for Submersed Aquatic Vegetation by Yao Yin (USGS/UMESC) and Heidi Langrehr (WIDNR)**

Yao Yin showed slides at the November 6, 2003 A-Team meeting that illustrated a successful transition from old (transect) to new (stratified random sampling) protocols. He observed that the trends they found were consistent with field observations for the past 12 years, and he reported trends in each study reach. A multivariate ordination analysis of the key LTRMP study reaches and the outpools revealed three relatively discrete clusters of pools:

- 1) Lower Pool 4—Pool 9
- 2) Pools 10—14
- 3) Pools 15-26 and the Peoria, La Grange, and Alton Pools of the Illinois River.

Important environmental factors identified included a very significant correlation with turbidity and vegetation abundance, and with water level fluctuation. Clear and stable water had a better chance of having abundant Submersed Aquatic Vegetation. Variations between years did not show as much correlation for each individual pool as spatial correlations did.

Habitat Rehabilitation and Enhancement Projects (HREP): The Stoddard Bay project in Pool 8 had enough data to evaluate and was a sizable project. Species colonization showed rapid response as compared to a control, and plant abundance showed a similar response. The evidence is very strong that submersed and rooted floating leafed vegetation responded to the HREP and is still changing. Just last year, they began to observe emergents as well. They also examined different species within the project area. Wild celery increased and leveled off. Coontail and American lotus, which are important for invertebrates, but not so much for wildlife, rapidly gained dominance in shallower, more protected, areas. Wild celery flourished in deep and less protected areas. This indicates you can determine what you want and construct that. Data is still showing a changing response after 5 years. This suggests we need some time to evaluate the full effects of an HREP.

Drawdown: The trend in Pool 8 over the years had been on an upswing for aquatic vegetation anyway. To pinpoint the effects of the poolwide drawdown, they compared Pool 8 to LTRMP study pools (upper and lower Pool 4 and Pool 13) not drawn down. They identified species that changed and calculated the probability if drawdown did not effect vegetation. The statistics say the drawdown definitely increased emergent vegetation, rooted floating leaf vegetation showed no difference, and the drawdown promoted Submersed Aquatic Vegetation. Without the other LTRMP pools for comparison, they would not have been able to conclude this statistically. The other key pools were essential to pinpoint the effects of drawdown.

Sampling Protocols: Stratified Random Sampling covers much larger areas with much fewer points and the transition from older transect methods to the stratified random design was successful.

Annual status and trends: As of 2002, Submersed Aquatic Vegetation (SAV) was at or near best the condition recorded since 1991 in the upper impounded pools. In the lower (more southern) reaches, SAV remained very scarce. Lake Pepin had a positive effect on SAV in the upper impounded pools. Outpool sampling enabled us to make inferences about the system, and the transition from old to new protocol did not interrupt trends or adversely affect the data

### **Management and Monitoring Implications From Water Quality Analyses**

First, Jim Fischer discussed tributary influences. One major LTRMP finding first discovered in Pool 8 (WIDNR, USGS) was persistent spatial gradients of meters—kilometer scale. There was a west to east gradient in conductivity in that was due to tributary influences—they found it in other pools also as shown by SRS results over the years. Fischer stressed that we might be missing important facts if we simplify monitoring too much, especially downstream of tributary inputs. The magnitude of the influence varies with relative discharges of the tributaries and main channel. For organisms in backwater areas, nitrogen gradients also possibly have an influence.

Dave Bierman (IADNR) looked at effects tributaries were having on the main channel and backwaters. In backwaters with tributary and main channel sites nearby, the main channel sites correlated more with backwaters than with tributary sites. This was a function of relative discharge and has design implications—we would probably see better correlation with tributary sites if we were chasing events. We should possibly introduce some episodic sampling.

Rob Burris (MNDNR) looked at suspended solids and water clarity. Upper Pool 4 had less clarity than lower Pool 4, reflecting the Minnesota River influence and Lake Pepin's effectiveness as a sediment trap. Lower Pool 4 had the lowest suspended sediment concentrations in the system. We expected backwaters to be lower in suspended solids, but on average they tend to be similar to the main channel. Other results show this might be due to shallow, silty sediments that easily resuspend or to algal producers (under proper conditions). Yao Yin combined these findings with his vegetation data and observed that at turbidities of at least 40 NTU, he saw declines in vegetation. John Sullivan is proposing a turbidity criteria of 20 NTU's via UMRCC. Based on the vegetation data, Sullivan's 20 NTU is a good recommendation for establishment and maintenance of Submersed Aquatic Vegetation beds on the UMRS. For surface water temperature, Fischer noted a positive slope in 9 years of monitoring. If it's a trend, 1 to 2 degrees Celsius might have significant effects on biota.

Exceedences in the well establish Dissolved Oxygen (D.O.) criteria of 5 mg / liter had management implications. In 1993-2001 SRS data they determined an area-weighted frequency for the percent sites below 5 mg/liter. Adequate D.O. in over wintering habitat

is of concern for fish. The data shows that summer has the highest frequency of low D.O's., however, saturated values for D.O. are also lower (only 7-8mg /L) in summer. Fish can also move to channel areas in the summer. Surprisingly, Pool 13 had greater surface areas affected by low D.O. than the La Grange reach of the Illinois River did. Information like this can provide additional tools for HREP management.

The light penetration work did this past summer provided data for the vegetation dynamics model and surrogates for light penetration. It turned out take more effort than routine monitoring ever would have been, but it was a good effort, which will enhance Yao Yin's vegetation model and help determine tributary criteria for John Sullivan. Understanding tributary influences adds value to the historical LTRM data—we can take turbidities and suspended solids and hind cast to see what light conditions were like for the period of record for LTRM—we're making progress.