Attachment I-Response to SONAR

Notes from Lake Minnetonka Conservation District Meeting-
Debriefing on the 3 Bay Treatment Program
August 22, 2008

Notes: These treatments were done in May, not April, 2008, as stated here.

The concentration of herbicide was reduced significantly from label instructions: 20% of the stated concentration for Endothall and only 10% for Triclopr.

15 to 18 hours after treatment, the chemicals were 80/ 90% gone. Most of the concentration had moved to deeper waters.

Conclusion: This experimental treatment was a dismal failure in its objective of controlling milfoil, because herbicide concentrations had been reduced excessively from Manufacturer's recommendations.
Thus, approximately $175,000 of taxpayers money was wasted!

Quotes:

Welling-DNR	**"The results were not what we were hoping for."**
	"There were disconcerting levels of dispersion."
	"Failure was attributable to chemicals not in contact long enough."
	"We are in uncharted waters."
Skogerboe-Army Corps of Engineers	**"15 to 18 hours after the treatment, the highest concentration of Endothal was out in the middle of the bay in deep water."**
	15 to 18 hours after the treatment, it was like we did not have a Tryclopr treatment at all."
	"We have seen treatments where applicators did everything wrong and it turned out better than these treatments."

THREE BAY TREATMENT PROGRAM
LAKE MINNETONKA MAY 2008

Costs (nearest $1000) per Dick Osgood

Carmens Bay	**47,000**
Grays Bay	**66,000**
Phelps Bay	**60,000**
	173,000

Payments to applicators

Carmens Bay	**40,755**
Grays Bay	**55,371**
Phelps Bay	**51,257**
	147,383

Contributions to the treatment program
Per Dick Osgood (nearest 1,000)

LMCD	**30,000**	
DNR	**25,000**	
Lakeshore residents		
Carmens Bay	**31,000**	
Grays Bay	**54,000**	
Phelps Bay	**50,000**	**(This includes 12,000-Mound, 6,000 Minnetrista, 6,000 Shorewood, Cities contributions)**
Total Contributions	**190,000**	**(16,000 to be applied to next years program)**

Draft Report on Herbicide Residues Following April 2008 Treatments of Three Bays on Lake Minnetonka

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[Rcvd on 21 August 2008]

Background:
In April 2008, large areas of Carmans Bay, Phelps Bay, and Grays Bay on Lake Minnetonka were treated with a combination of the registered aquatic herbicides-endothall and triclopyr. Treatment plans called for endothall and triclopyr to be applied at target concentrations of 1 mg a.i./L and 0.25 mg a.e./L respectively. For perspective, the maximum label rate of endothall is 5.0 mg a.i./L and triclopyr is 2.5 mg a.e./acre. In conjunction with these treatments, US Army ERDC personnel collected water samples and conducted analyses to determine residuals for the two active ingredients. Sampling protocols were designed to determine initial dilution and dispersion patterns in order to link efficacy to herbicide residues.

Treatments:
Carmans Bay – Approximately 95 acres (avg. 6.4 feet deep) were treated on April 13, 2008. Herbicides were applied by boat with subsurface injection via trailing hoses. The shorelines closer to the main body of the lake were treated with endothall at 1 mg/L and triclopyr at 0.5 mg/L (Fig 1). The entire treatment represented 48% of the littoral area or 23% of the 403-acre bay. Notes from the treatment date indicated that prevailing winds averaged between 10 and 15 mph on the day of treatment. Water temperatures were between 12 and 12.5 C.

Phelps Bay - Approximately 150 acres (average 5.9 feet deep) were treated on April 14, 2008. Herbicides were applied by boat with subsurface injection via trailing hoses. This treatment represented 55% of the littoral area or 40% of the 373-acre bay. Notes from the treatment date indicated that winds were < 6 mph and remained light and variable for several days post-treatment. Water temperatures were between 12 and 12.5 C.

Grays Bay - Approximately 160 acres (average 5.7 feet) were treated on April 14, 2008. Herbicides were applied by boat with subsurface injection via trailing hoses. This treatment represented 91% of the 175-acre bay. Notes from the treatment date indicated that winds were between 4 to 6 mph and remained light and variable for several days following the application. Water temperatures were between 12 and 12.5 C. Grays Bay is located near the outlet of Lake Minnetonka, and water flow rates were measured at approximately 150 CFS (or 300 acre feet per day). This issue was discussed in a pretreatment conference call and it was decided that while the rate of outflow was not optimal from a treatment efficacy standpoint, the closed nature of the bay would insure that exposures would be dictated by outflow versus dispersion from the treatment zone.

Water Sampling:
Water samples were collected by US Army ERDC personnel prior to the treatment and at 1 (15-18 hour), 2, 3, and 4 days post-treatment on all three bays. Carmans was further

sampled at 5, 8, and 15 days, and Phelps and Grays were sampled at 7 and 14 days post-treatment. Sample sites for each bay were selected both within and outside of the application zones. This allowed for determination of herbicide residence within the plots as well as dispersion of residues from the treated areas. Maps showing the treated areas and water sample sites are included in Figures 1, 2, and 3.

Figure 1. Carmans Bay treatment area (shaded sites) and locations of 6 water sampling sites.

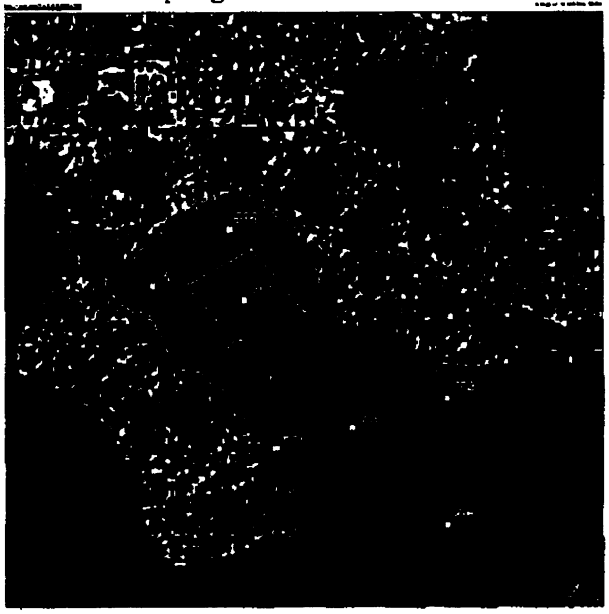


Figure 2. Phelps Bay treatment area (shaded sites) and locations of 6 water sampling sites.

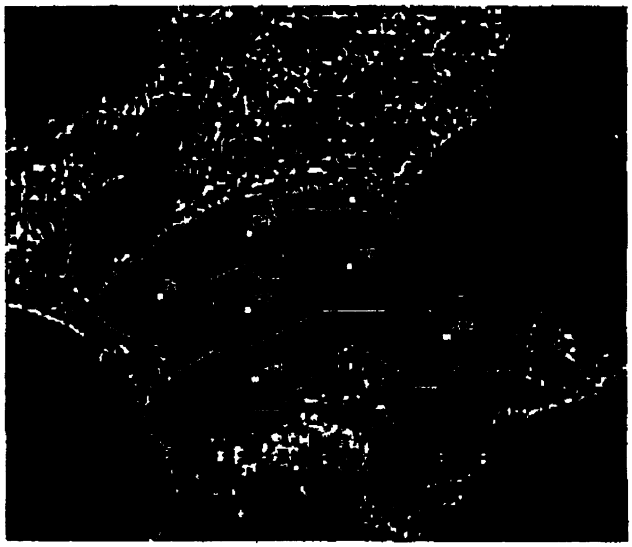
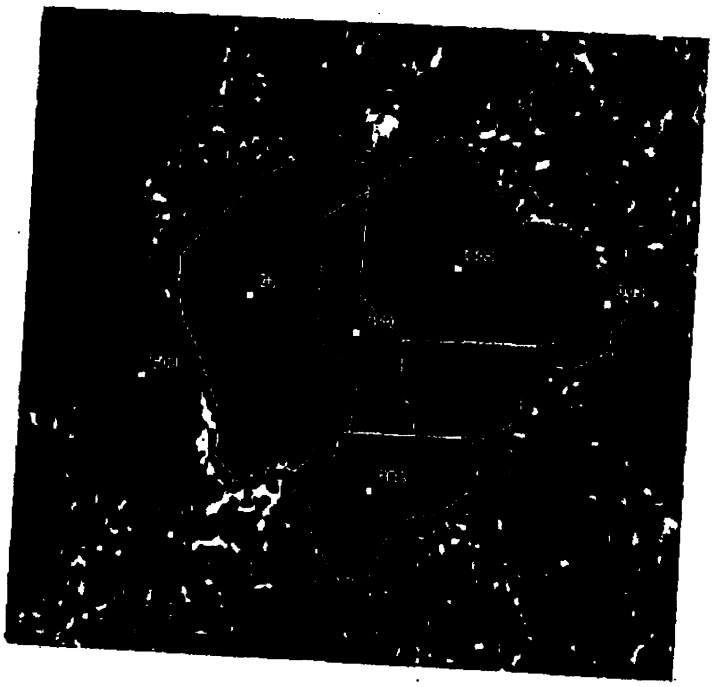


Figure 3. Grays Bay treatment area (shaded sites) and locations of 6 water sampling sites.



Based on prior experience with liquid herbicide applications, the majority of water samples were collected at mid-depth. Within each bay sites were also designated for vertical sampling at 3 depths (25, 50, and 75% of the average depth). Vertical water column sampling is conducted to insure that herbicides spread from top to bottom in the water column.

Following collection, water samples were acidified and shipped to the University of Florida Center for Aquatic and Invasive Plants. Endothall analyses were conducted via immunoassay. For triclopyr analyses, water samples were shipped to the SePRO Corporation for analysis via immunoassay and HPLC. Results are analyzed and reported as the endothall acid and triclopyr acid. This is an important distinction, as the recommended treatment rates of 1.0 mg/L endothall represent the active ingredient concentrations of the endothall salt. The maximum recoverable endothall acid would be 0.71 mg/L (710 ppb) based on the 1.0 mg/L treatment. The maximum recoverable residue of the triclopyr would be 0.25 mg/L. The y-axis of the residue graphs in Figures 4, 5, and 6 reflect the maximum detectable residues for both endothall and triclopyr based on the target application rates to the treatment plots.

Results:

Pretreatment sampling indicated residues of both endothall and triclopyr were not detectable. Following herbicide application, data indicate there was a rapid dilution within and dispersion of residues from Carmans Bay (Figure 4). While the target endothall concentration was 710 ppb in the treatment plots following application, residues collected at ~15 hr post-treatment were typically reduced by 80 to 90%. Moreover, residues were essentially equivalent both within and outside the treated areas, suggesting rapid dispersion from the treated area. A similar pattern of dilution and dispersion was also noticed for triclopyr residues (Figure 4). Based on the cold water temperatures (12 C) at the time of application, it is highly unlikely that microbial degradation played a role in the loss of endothall from any of the treatment sites during the initial 15-hour period.

The residues detected in Phelps Bay showed better retention through ~15 hr post-treatment when compared to Carmans Bay; however these initial concentrations were still less than 50% of the target rate (Figure 5). The pattern of residue dissipation from the individual sites was not consistent.

Despite the above-mentioned concerns with outflow from Grays Bay, this treatment provided the most consistent pattern of initial residue detection and degradation over time (Figure 6). Treatment of a large fraction of this Bay still only resulted in detection of initial residues less than half of the predicted concentration. Nonetheless, in contrast to Carmans and Phelps, residue dissipation was much slower resulting in several days of exposure to herbicide concentrations that could provide herbicidal impacts.

Vertical water column sampling in all three bays (Carmans sites 2 and 4, Phelps sites 1 and 2, and Grays site 3) indicated that herbicides were distributed evenly through the water column. This is indicative of isothermal conditions at the time of treatment and it may explain the rapid mixing of residues from the treatment sites to the deeper water areas within the bays.

Discussion:

The detection of much lower than expected residues at 15 hr post application in the treatment plots of all 3 bays indicates an initial rapid dilution of herbicides within the bays. It is very likely the water from the treated areas rapidly mixed with untreated water in the deeper zones resulting in much lower than predicted initial concentrations. The detection of relatively high residues in plots established outside of the treatment zones is evidence of rapid dilution within the bays. Furthermore, within both Carman and Phelps bay, the inability to maintain these initial, albeit lower residues over time, suggests rapid dispersion of the treated water into the main lake.

Our research group has focused numerous trials on the relationship between herbicide concentration and exposure time (CET) and target plant control. Higher concentrations of herbicide can provide control given shorter exposure periods, while lower