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FIELD EVALUATION OF TWO ENDOTHALL FORMULATIONS FOR MANAGING HYDRILLA IN GATUN LAKE, PANAMA

by

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Aquatic plant coverage of Gatun Lake has steadily increased since completion of canal construction in 1914. Hydrilla (*Hydrilla verticillata* (L.F.) Royle) and waterhyacinth (*Eichhornia crassipes* (Mart.) Solms) are the major nuisance plants. Analysis of aerial photographs has shown these plants to have an areal distribution of approximately 5400 ha.

In April 1979, a cooperative field study involving Pennwalt Corporation,

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20. ABSTRACT (Continued).

Panama Canal Commission (PCC), and the U. S. Army Engineer Waterways Experiment Station was initiated in the Frijoles Bay area of Gatun Lake, Panama. The objectives were to: (a) evaluate the efficacy of two endothall formulations, i. e., Aquathol K and Hydout, for hydrilla control; (b) determine the effects of each formulation on water quality and the nontarget planktonic community; (c) evaluate the extent of herbicide dispersion in the test area; and (d) determine persistence of herbicide residues in water, hydrilla, and sediment within the test plots for supporting Federal registration of Hydout and expansion of the current Federal label for Aquathol K.

Three equivalent treatment rates of each formulation were selected for comparison based on a preliminary site survey. The endothall acid equivalent (a.e.) treatment rates were 27, 34, and 50 kg a.e./ha. The treatment rate and formulation combination were randomly assigned to six of eight plots. The remaining two plots were considered as reference areas.

Aquathol K and Hydout were effective at controlling hydrilla within the treatment plots. Aquathol K provided control within 24 to 72 hr posttreatment at each application rate; however, Hydout was much slower, requiring 14 to 21 days before hydrilla knockdown was evident at the two higher application rates. The 27-kg-a.e./ha Hydout treatment showed only slight evidence of hydrilla defoliation and biomass reduction prior to plant regrowth to the water surface.

No adverse impacts on selected water quality parameters, e.g. dissolved oxygen, pH, water temperature, total Kjeldahl nitrogen, ammonia nitrogen, and total phosphorus, were observed. Only transitory shifts in the plankton community composition and vertical distribution were observed over the 49-day study period.

Herbicide dispersion from the treated area was apparent during the first 3 days following treatment. Endothall was detected in the water from the buffer zones of those plots treated with Aquathol K. Negligible endothall residues were found in the buffer zones surrounding the plots treated with Hydout throughout the 90-day posttreatment study period. Persistence of endothall in the water from those plots treated with Aquathol K and Hydout was less than 7 days. However, endothall persistence from those plots treated with Aquathol K was less than 3 days in sediment and less than 7 days in plant tissue. Endothall levels in sediment and plant tissue from Hydout-treated plots persisted for more than 21 days following treatment.

Combinations of Aquathol K and Hydout are recommended as a suitable alternate to copper sulfate for managing hydrilla in Gatun Lake. Although unit costs are approximately five times more expensive for endothall compared to copper sulfate, the lower potential of endothall formulations for toxicity to and accumulation in nontarget organisms following treatment must be considered as well as its long shelf life during storage in this humid, tropical environment.

PREFACE

This study was sponsored by the Panama Canal Commission (PCC), Balboa Heights, Republic of Panama, and the Corps of Engineers' Aquatic Plant Control Research Program (APCRP). The project was a cooperative effort between the APCRP, the Dredging Division of the PCC, and Pennwalt Corporation. The work was initiated in April 1979 under the general supervision of Dr. John Harrison, Chief, Environmental Laboratory (EL), of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss., and Dr. Rex L. Eley, Chief, Ecosystem Research and Simulation Division (ERSD), EL. The work was under the direct supervision of Dr. Robert M. Engler, Chief, Ecological Effects and Regulatory Criteria Group (EERCG), ERSD, and Mr. Cesar Von Chong, PCC. The Principal Investigator was Dr. Howard E. Westerdahl, EERCG. Funding was provided by the PCC and the APCRP. Mr. J. Lewis Decell was Program Manager for the APCRP.

The work was performed by Dr. Westerdahl, Messrs. Edgar Hummert, Steve Parris, Glenn Rhett, Martin Brodie, and Steve Brock of WES; Messrs. Larry Nall and Jeffrey Shardt of Florida's Department of Natural Resources; and LTC Phillip E. Custer and Messrs. Von Chong, Wally Murdock, and George Bouche of PCC. Additional assistance was provided by personnel of the Water Quality Laboratory, PCC, and Dr. Kerry K. Steward and Mr. Thomas Taylor of the U. S. Department of Agriculture, Aquatic Plant Management Laboratory, Fort Lauderdale, Fla. Phytoplankton and zooplankton were identified and enumerated by Dr. Rick Meyer, University of Arkansas, Fayetteville, Ark. Statistical analyses were conducted by Dr. Boyd Loadholt, Medical University of South Carolina, Charleston, S. C.

Commanders and Directors of the WES during the study and preparation of the report were COL Nelson P. Conover, CE, and COL Tilford C. Creel, CE. Technical Director was Mr. F. R. Brown.

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CONTENTS

LIST OF FIGURES

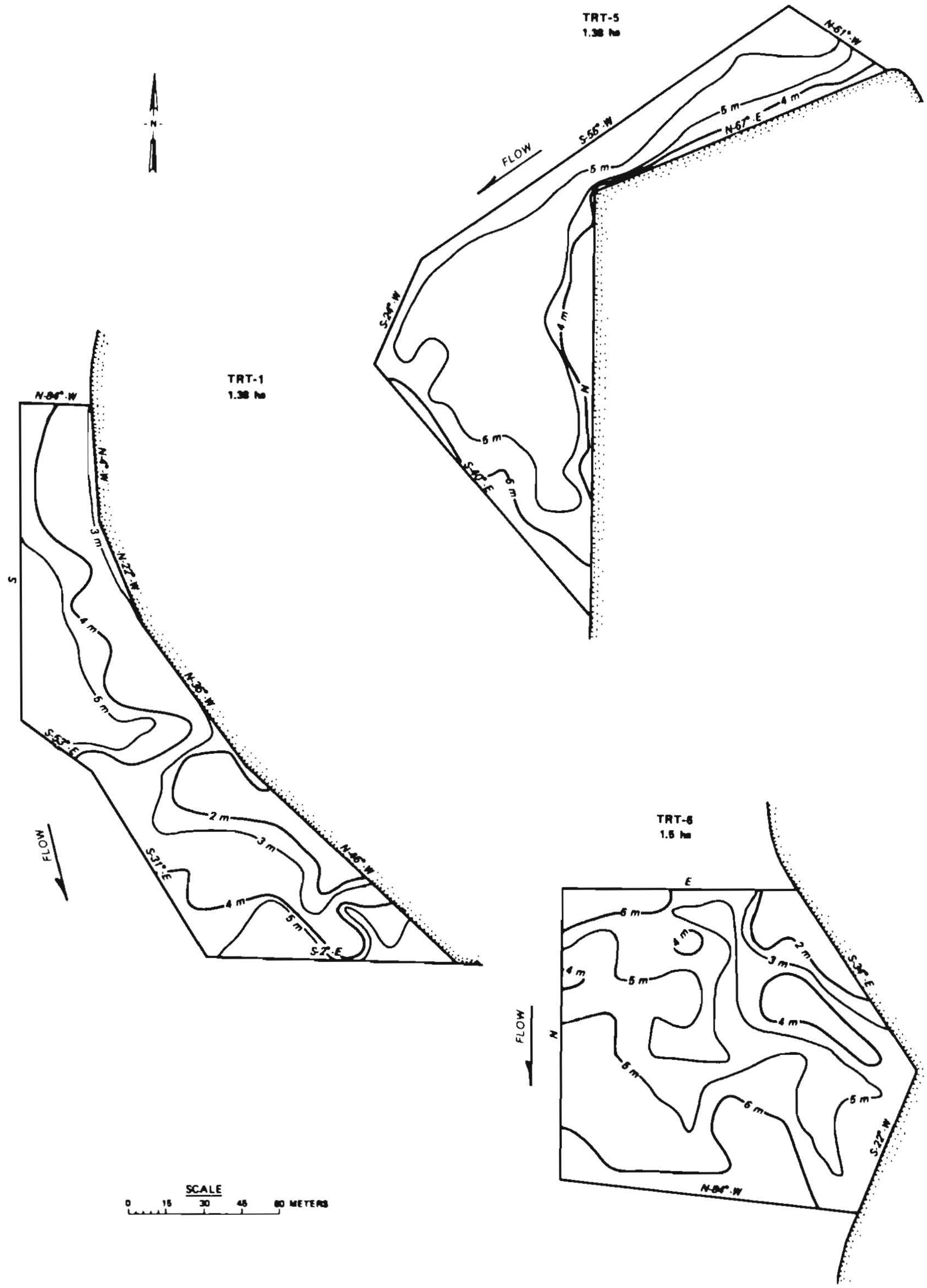

Figure 3. Bathymetric profile of plots 1-8 in Frijoles Bay of Gatun Lake, Panama (Sheet 1 of 3)

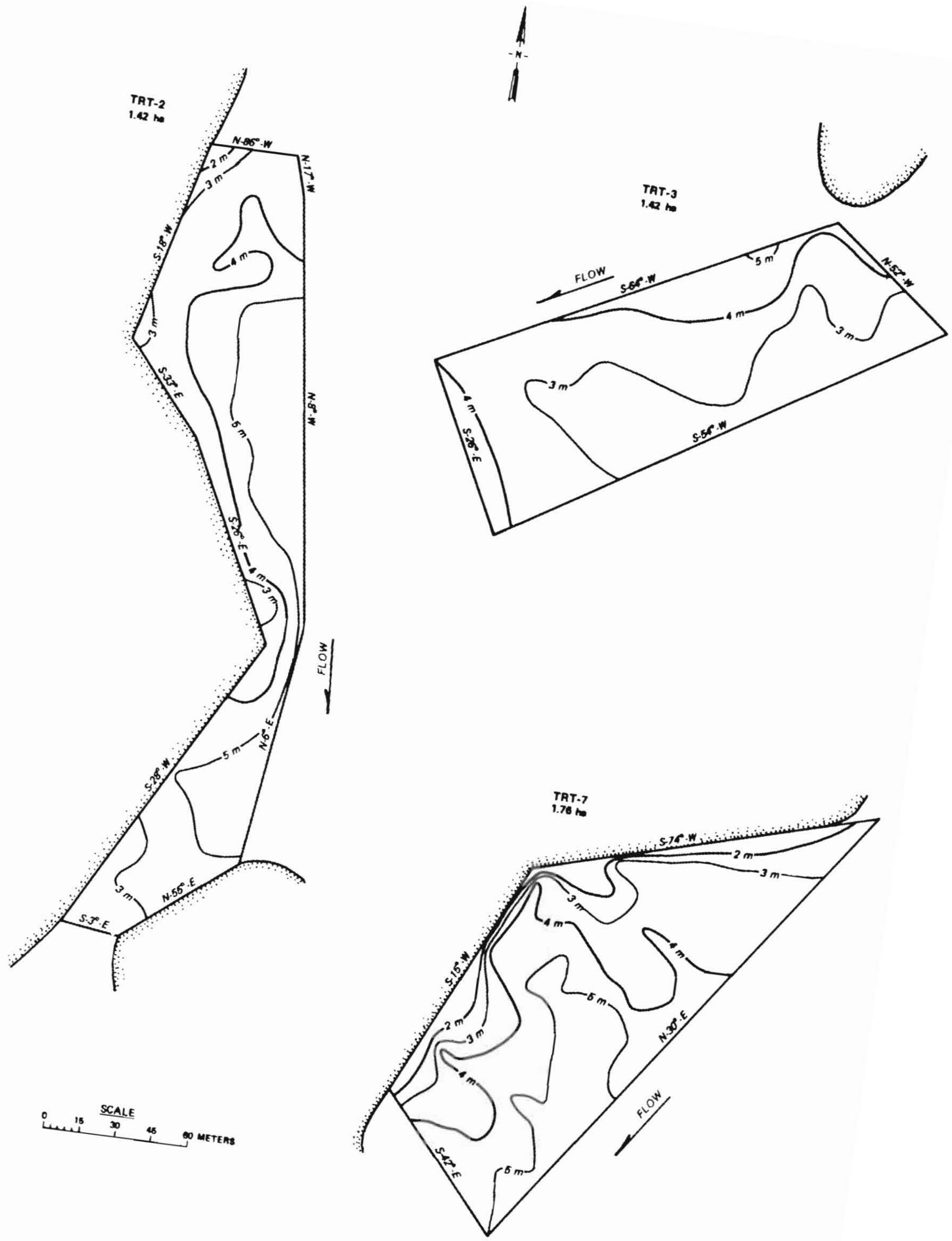

Figure 3. (Sheet 2 of 3)

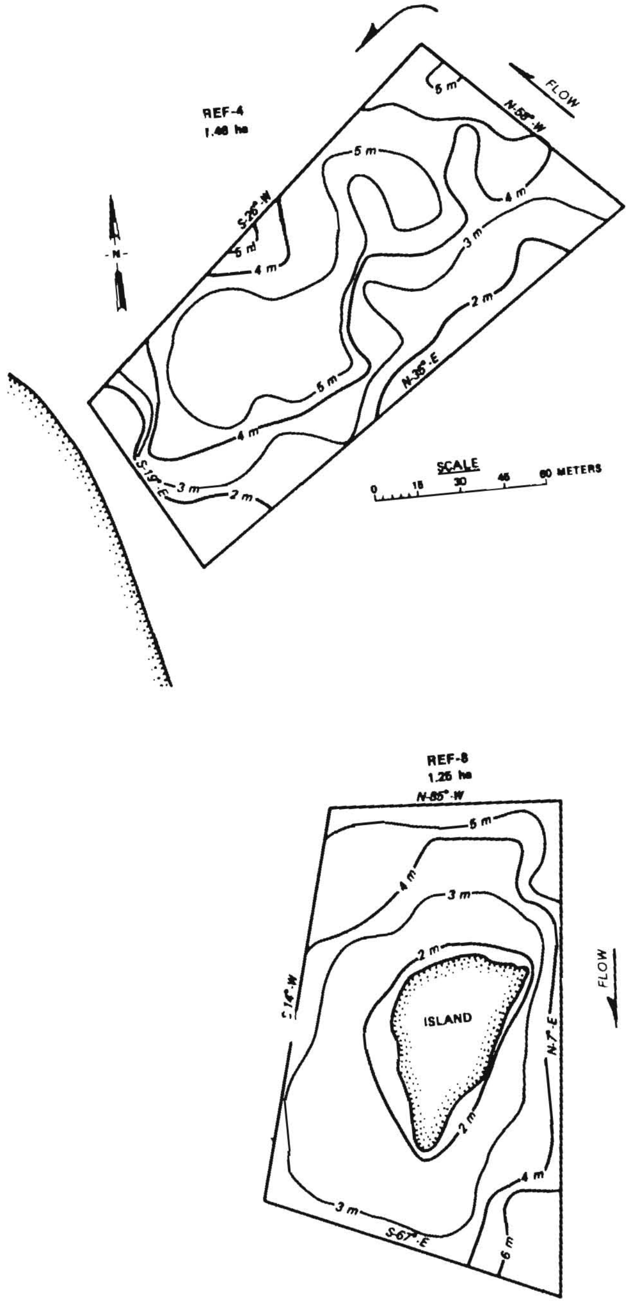

Figure 3. (Sheet 3 of 3)

level data obtained during the study, computations of the static-water volume and mean water depth for each plot showed that the projected estimated treatment rates were in error. Better estimates of initial endothall concentrations in water were computed following analysis of the additional data: TRT-1, 0.67 ppm a.e.; TRT-2, 1.06 ppm a.e.; TRT-3, 0.63 ppm a.e.; TRT-5, 1.10 ppm a.e.; TRT-6, 0.65 ppm a.e.; and TRT-7, 0.86 ppm a.e. These concentrations assume that all of the endothall is immediately available throughout the water column following application.

15. Personnel from the U. S. Department of Agriculture Aquatic Plant Management Laboratory in Fort Lauderdale, Fla., with assistance from PCC personnel, applied both endothall formulations. The dimethylalkylamine endothall formulation was applied to the respective treatment plots on 18 April 1979 using a blower-type spreader mounted on the bow of a PCC airboat (Figure 4). Half of the formulation was applied on parallel lines across the treatment plots, while the other half was applied on lines perpendicular to the first application. Any remaining herbicide was applied diagonally across the plot. Treatment plots paralleling the shoreline required that the formulation be applied as before except the treatment was initiated along the shoreline. This prevented trapping and possibly killing fish near the shore. Only the hydrilla in the southwest corner of TRT-2 was not adequately treated due to a malfunction in the application equipment during treatment; hence, very little herbicide was applied to this portion of TRT-2. On 19 April 1979, dipotassium endothall was applied approximately 1 m below the water surface using a PCC airboat equipped with a conventional spray pump and four weighted-trailing hoses, i.e., two each fore and aft, coupled to a manifold located along the bow (Figure 5). Dense hydrilla cover throughout the treatment plots prevented the trailing hose from delivering the herbicide near the sediment surface. The same treatment procedure, as previously described, was used to ensure uniform areal coverage.

Figure 4. Application of pelletized dimethylalkylamine salt of endothall (Hydout) using a blower-type pellet applicator (Hydout dust can be seen rising from the hopper of the application equipment)

Figure 5. Application of the dipotassium salt of endothall (Aquathol K) using weighted-trailing hoses

Sampling Program

16. A simple randomized sampling program was selected for all measured parameters since the vegetation uniformly covered more than 90 percent of the surface area of all plots. This sampling program provided a rigorous comparison of the two endothall formulations for efficacy on hydrilla over the entirety of each treatment area. Herbicide dispersion and subsequent reduced efficacy are usually measured or observed along treatment area boundaries. This effect is caused by herbicide movement out of the treated area as a result of water flow or along density gradients in the water column. Reduced hydrilla efficacy along the treated area boundaries was not considered separately in the data analyses since efficacy comparison over the entire treated area was a primary objective of the study. Consequently, this sampling program allowed the plot boundary areas to be sampled and analyzed with similar frequency as was the rest of the plot.

17. The procedure for selecting a sampling site required that a sequentially numbered 15- by 15-m grid overlay be placed on a scaled drawing of each plot. The specific sampling locations for each date were selected from a Random Number Table (Steel and Torrie 1960). Approximately 12 sampling locations per hectare were designated based on the estimated 12 plant biomass samples per hectare required to adequately evaluate areal changes in standing crop and plant biomass. The actual number of plant biomass samples exceeded the number of samples required for analysis of water quality parameters, herbicide residues, and plankton; consequently, these latter sampling locations were randomly selected from the plant biomass sampling locations. New sampling locations within each plot were selected prior to each sampling date. The buffer zones between the corner markers of each plot were sampled approximately 15 m perpendicular to the midpoint of each plot boundary to observe endothall drift from each plot and subsequent effects on vegetation and associated water quality parameters.

18. The number of sampling locations required for each parameter is listed below. The specific sampling locations for these parameters are identified in Appendix A.

Parameter	Plot 1	2	3	4	5	6	7	8
Hydrilla biomass	16	16	16	17	16	18	16	15
Herbicide residue								
Water	3	3	3	3	3	3	3	3
Sediment	4	4	4	4	4	4	4	4
Plant	10	10	10	10	10	10	10	10
Water quality	3	3	3	3	3	3	3	3
Plankton	5	5	5	5	5	5	5	5

19. A survey crew in two boats preceded the sampling parties to the treatment plots to mark each sampling location with a numbered buoy. Determination of the sampling position was accomplished using a Leitz Model 2691 line-displacing-type range finder and a Silva Range Type 15TDCL azimuth compass. Triangulation was used to position each buoy. The procedure required one boat to remain positioned at a corner stake while the other boat containing the buoys was guided to the midpoint of the specified sampling quadrant using two-way radio communication and sequential triangulations between the moving boat and another corner stake to determine position.

Sampling frequency

20. Rapid endothall uptake by hydrilla and subsequent microbial decomposition of the endothall in warm water (Haller and Sutton 1973; Simsimon, Chesters, and Daniel 1976) required that frequent samples for herbicide residue analysis in water, sediment, and plants be obtained at short intervals immediately following treatment and continued throughout the study until the endothall concentration fell below detection limits (i.e. 0.01 ppm). Water quality, hydrilla biomass, and plankton were sampled at the same time that samples for endothall residue levels were

obtained. Pretreatment sampling of each plot was completed from 11-17 April 1979. Posttreatment samples were obtained on approximately day 1, 3, 7, 14, 21, 49, and 90. Plots 1 through 4 were sampled in the morning and plots 5 through 8 in the afternoon. Slight deviations from this schedule were a result of inclement weather or equipment malfunctions. Reference and treatment plots were evaluated identically throughout this study.

Hydrilla biomass

21. A plant biomass sampler (Figure 6) designed and developed by

Figure 6. WES aquatic plant biomass sampler

WES in cooperation with Allied Aquatics, Inc., was used to collect hydrilla at each sampling location. The stainless steel, cylindrical bucket with a 0.267-sq-m opening was slowly lowered through the water column as rotating cutter bars severed the vegetation (Figure 7). The plant fragments were trapped inside the cylindrical bucket. A hydraulic-activated securing gate closed the bottom of the bucket prior to retrieval preventing most of the hydrilla cuttings from slipping out. Each sample (Figure 8) was removed from the bucket, washed to remove

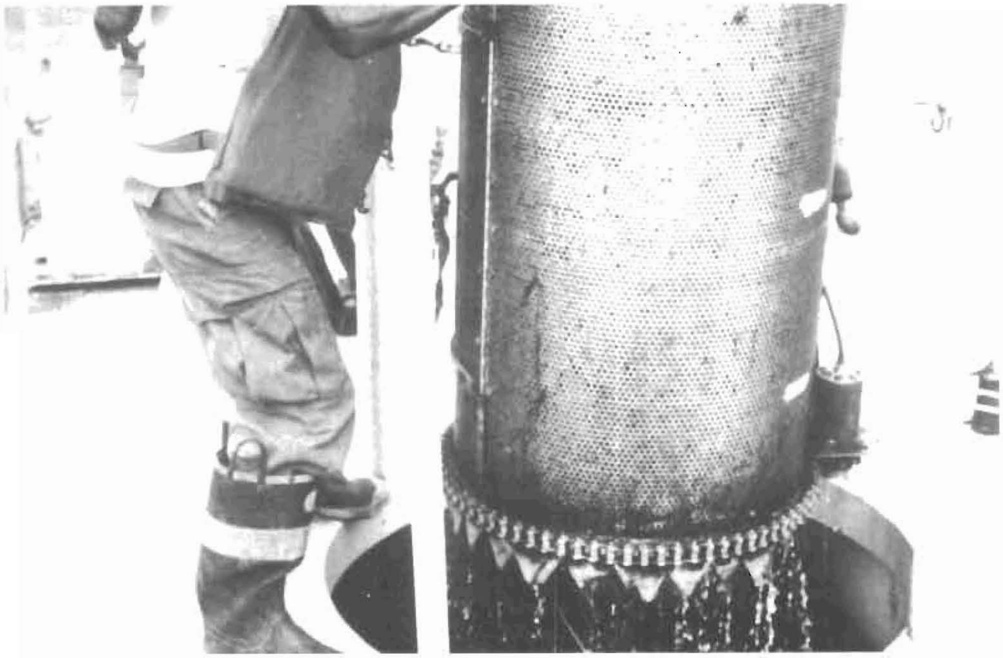

Figure 7. WES aquatic plant biomass sampler's cutting head showing the one inner stationary and one outer rotating row of cutting bars

Figure 8. Hydrilla being removed from the sampler and placed in a plastic bag for processing

sediment, and drained of free water. Each sample was weighed (accuracy: ±45 g) and recorded as wet weight (Appendix B).

Herbicide residue

22. Water. Water samples from three randomly selected locations within each of the eight plots were collected using a 12-V direct current (DC) Jabsco, Inc., pump attached to a weighted hose. Samples were taken at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment. For endothall residue analysis, each polyethylene sampling bottle was placed immediately in an ice-water brine solution and later frozen and stored until shipment to Pennwalt Corporation for analysis. Sample preparation and analysis were as described by Carlson, Whitaker, and Landskov (1978). All water samples were sequentially analyzed in the order that they were obtained on each date until endothall residue concentrations were below 0.01 ppm a.e.

23. Sediment. Two divers from Florida's Department of Natural Resources assisted in the sampling of sediment for residue analysis. An aluminum sampling tube (approximately 10-cm inside diameter) was inserted approximately 15 cm into the sediment at each sampling location within the plot. Contents of the sampling tubes were secured by placing plastic caps on each end. The tube was placed immediately in an ice-water brine solution and was subsequently frozen after returning from the field. The frozen sediment samples were packed on dry ice and shipped by air freight to Pennwalt for analysis. Sample preparation and analysis were performed as previously mentioned. Samples were analyzed until endothall residue concentrations were below 0.01 ppm a.e.

24. Plant. Approximately 1.0 kg wet weight of hydrilla tissue from designated sampling locations in each plot was collected using the biomass sampler as previously described. However, where the hydrilla was controlled effectively, an anchor attached to a dragline had to be used to obtain plant samples lying on the bottom surface. Plant samples were taken from a minimum of 10 locations within each plot on the specified sampling day. All samples were washed to remove sediment and drained of free water prior to storing on ice while in the field. Each plant sample was frozen immediately after returning from the field. The

frozen plant samples were packed in dry ice and sent to Pennwalt for residue analysis. Samples were analyzed until endothall concentrations decreased below detection, i.e. 0.01 ppm a.e.

Water quality

25. Additional water samples from three sampling locations and water depths were collected for analysis of selected water quality parameters. At each location, water samples were taken at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment. Water was pumped from each depth into an acid-washed and rinsed 1.0-ℓ plastic bottle for determining biochemical oxygen demand (BOD_5). An additional 0.5-ℓ aliquot was collected in a new, previously rinsed polyethylene bottle for analysis of the remaining parameters, i.e. alkalinity, color, hardness, total Kjeldahl nitrogen (TKN), ammonia nitrogen (NH_3-N), total phosphate (TPO_4), and total dissolved solids (TDS). All samples were placed in an ice-water brine solution until they could be transported for analysis to the PCC's Water Quality Laboratory in Balboa Heights, Panama. Chemical analyses were initiated within 24 hr after delivery to the laboratory. Analytical techniques are described in the Standard Methods for Examination of Water and Wastewater (American Public Health Association 1976).

26. A Hydrolab, Inc., Model 8000 System was used to monitor air and water temperature, dissolved oxygen (DO), specific conductivity, pH, and water depth. Data were recorded at 0.3, 1.0, and 2.0 m below the water surface and 0.5 m above the sediment. A routine calibration check of the sensors was performed prior to and after each sampling trip.

27. Secchi depth was also monitored at each sampling station through posttreatment day 21. Air temperature varied slightly between a minimum of 27°C and a maximum of 32°C (mean = 29.7°C, 77 measurements). A standard Secchi disk with black-and-white quadrants was used as a relative measure of light penetration. A summary of these data is shown in Table 2. The presence of hydrilla obscured the Secchi disk at most sampling locations within all plots prior to applying the two formulations.

Plankton

28. Plankton samples were obtained prior to treatment and at regular intervals posttreatment from five randomly selected locations

within each plot. A 12-V DC Jabsco, Inc., self-priming pump was attached to a weighted hose and lowered at each of the locations sequentially to 0.3 and 2.0 m below the water surface and 0.5 m above the sediment. From each depth, a measured water volume was pumped through a No. 10 Wisconsin plankton net. The higher the plankton concentration per unit water volume, the more tendency there was to plug the bucket aperture; thus, the amount of water allowed to pass through the plankton net was reduced. This method of plankton sampling resulted in pelagic as well as some epiphytic plankton being obtained. The epiphytes were probably pulled off the leaf tissue when the hose was lowered to each water depth. Plankton samples were obtained from 9:00 a.m. to 3:00 p.m. central daylight time (CDT) on each sampling date. No order was assigned for determining which plots would be sampled first on a specific day. Consequently, diel migration of plankton populations was not evaluated. Each sample was preserved until analyzed at the University of Arkansas, Fayetteville, Ark.

29. In the laboratory, the plankton samples were standardized according to the amount of water passed through the plankton net. Ten-millilitre aliquots from each of five standardized sample sets obtained at each plot were combined according to water depth on each sampling date for each treatment and reference plot. Multiple subsamples were taken from each of the composited-by-depth standardized samples for microscopic examination. Each taxon of the phytoplankton was identified using a phase-contrast microscope at magnifications from 200× to 1000×. These data were grouped and recorded by depth and sampling date for each plot.

30. Five-millilitre aliquots from each of the composited-by-depth standardized plankton samples were placed in calibrated counting chambers. Zooplankton were enumerated at 60× with a Wild M40 inverted microscope. Likewise, these data were grouped and recorded by water depth and sampling date for each plot.

PART III: RESULTS

Hydrilla Biomass

31. Approximately 1 month prior to initiation of this investigation an aerial color infrared (IR) photograph was taken of the study area (Figure 9). The surface acreage of hydrilla in the northern

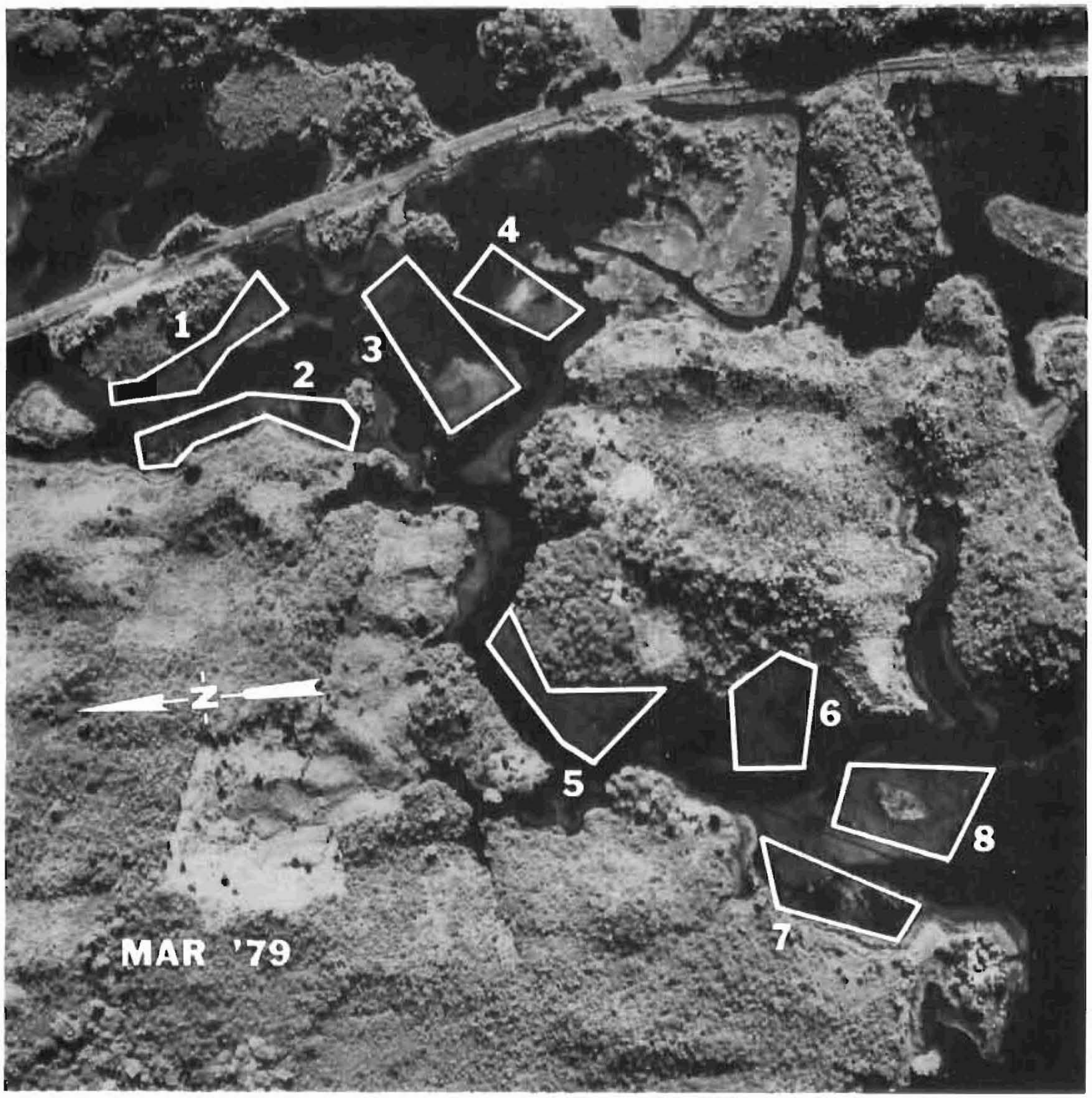

Figure 9. Color IR photograph (1:5000) of Frijoles Bay study area in Gatun Lake, Panama, March 1979

section of the Frijoles Bay, and, specifically, the experimental plots, was estimated to be 80 percent by interpretation of the color IR aerial photography and onsite evaluation. By 15 April 1979, surface acreage of hydrilla was approximately 90 percent of each plot. However, by posttreatment day 21, the hydrilla in the treated plots had dropped below the water surface, permitting easy access to all locations within the study area (Figures 10-13).

Reference plots

32. A gradual hydrilla decline in REF-4 was observed through posttreatment day 49 (Figure 14 and Appendix B). Endothall residue was found in hydrilla tissue through posttreatment day 14. Moreover, only 30 percent of the original plant biomass remained after 90 days. The decline in endothall residue concentrations and hydrilla biomass suggested movement of endothall from TRT-3 into REF-4. Consequently, REF-4 was eliminated from consideration as a reference for comparing results with other plots. However, the hydrilla biomass in REF-8 remained unchanged throughout the 90-day sampling period (Figure 15 and Appendix B).

Aquathol K: TRT-1, -6, and -5

33. The hydrilla in TRT-1, -6, and -5 exhibited pronounced herbicide effects within approximately 48 to 72 hr posttreatment (Figures 16-18). The leaves near the meristematic tips folded downward and were brown to translucent in color. Loss of chlorophyll was evident along the plant stems. Most of the hydrilla dropped below the water surface in all three plots over this time period. The hydrilla was nearly 2 m below the water surface by posttreatment day 7. More extensive tissue degradation was evident over larger portions of the plants.

34. Between posttreatment days 7 and 14 underwater observations clearly showed that the entire hydrilla biomass from TRT-1, -6, and -5 had settled to the bottom surface of the lake in large mounds. Most of the plant tissue remained green, but the stems and leaves were flaccid and easily pulled apart. Some defoliation was also observed.

35. By posttreatment day 21, the maximum reduction in hydrilla biomass was evident. Plant tissues were brown, translucent, and

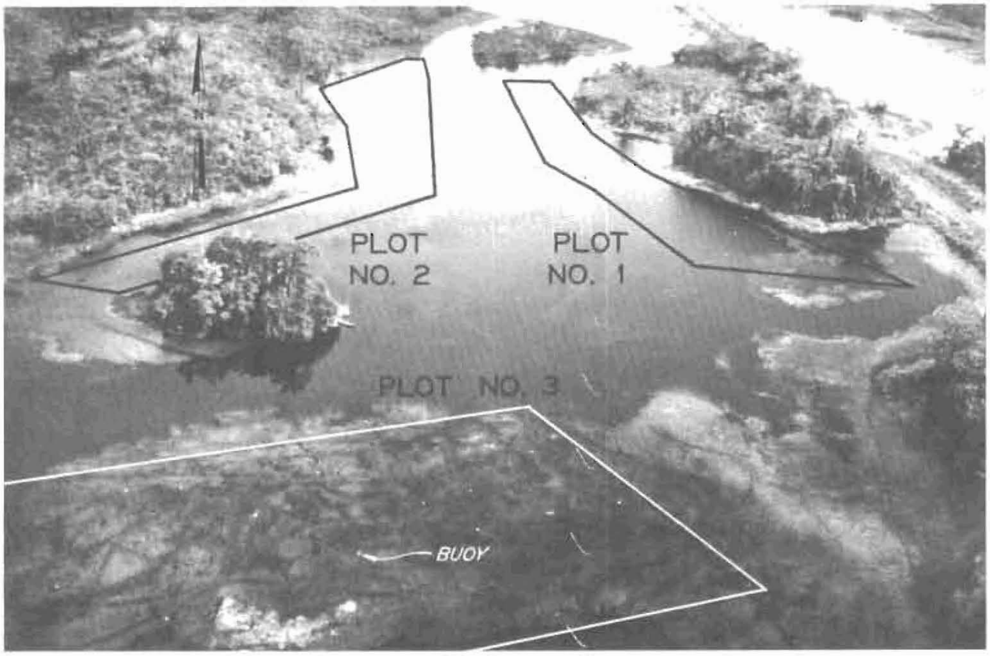

Figure 10. Aerial photograph of TRT-1, -2, and -3 approximately 21 days posttreatment

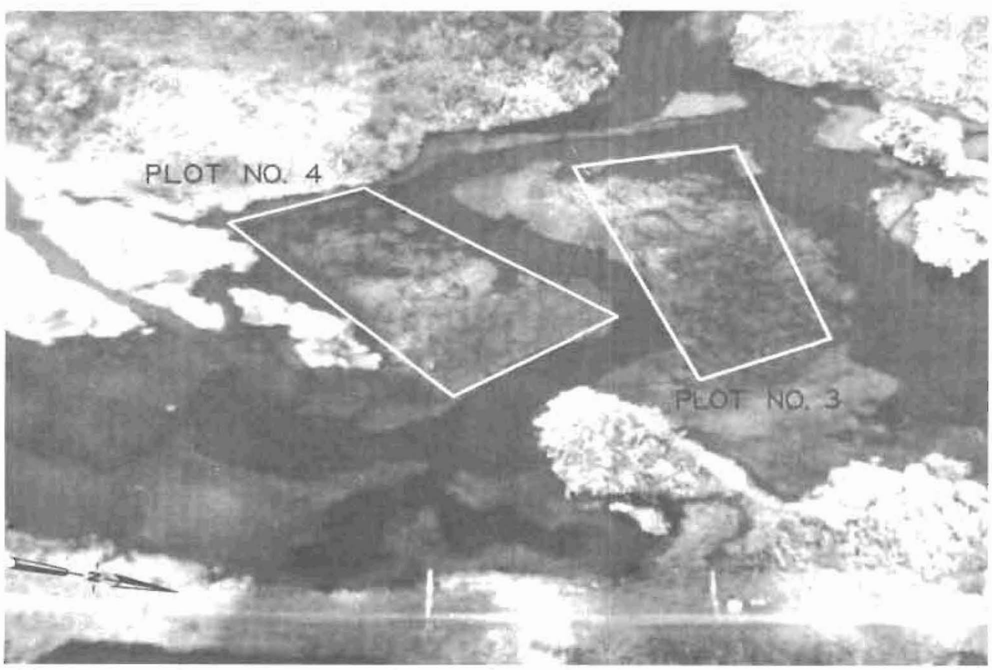

Figure 11. Aerial photograph of TRT-3 and REF-4 showing the dense surface mat of hydrilla approximately 21 days posttreatment

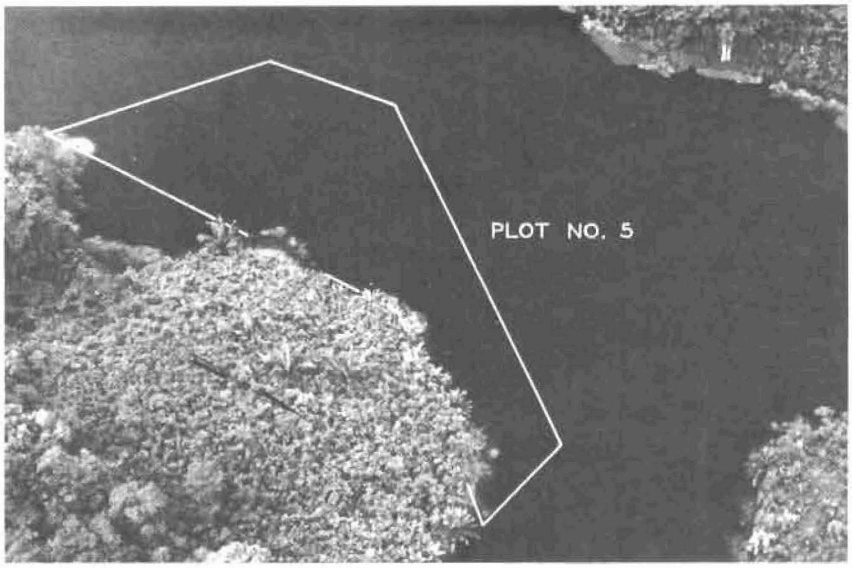

Figure 12. Aerial photograph of TRT-5 approximately 21 days posttreatment

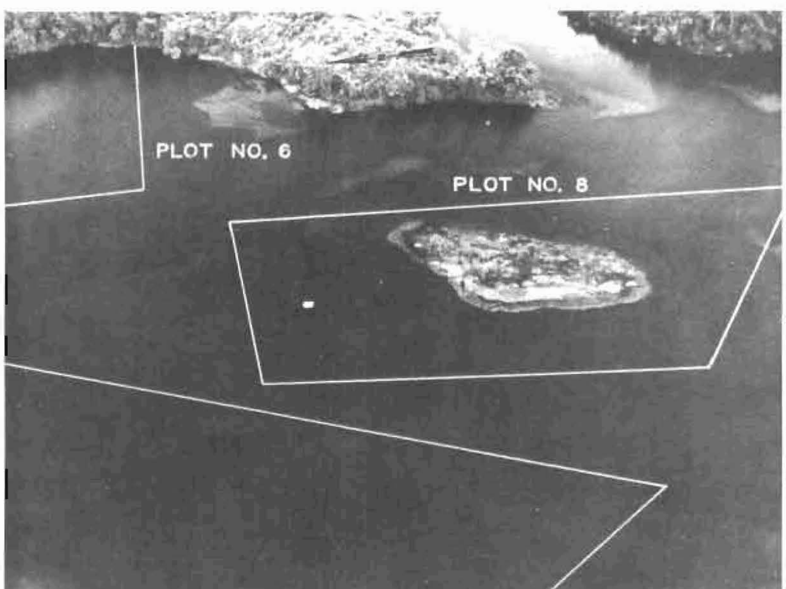

Figure 13. Aerial photograph of TRT-6, -7, and -8 approximately 21 days posttreatment (Note: Individual sampling site buoys are visible)

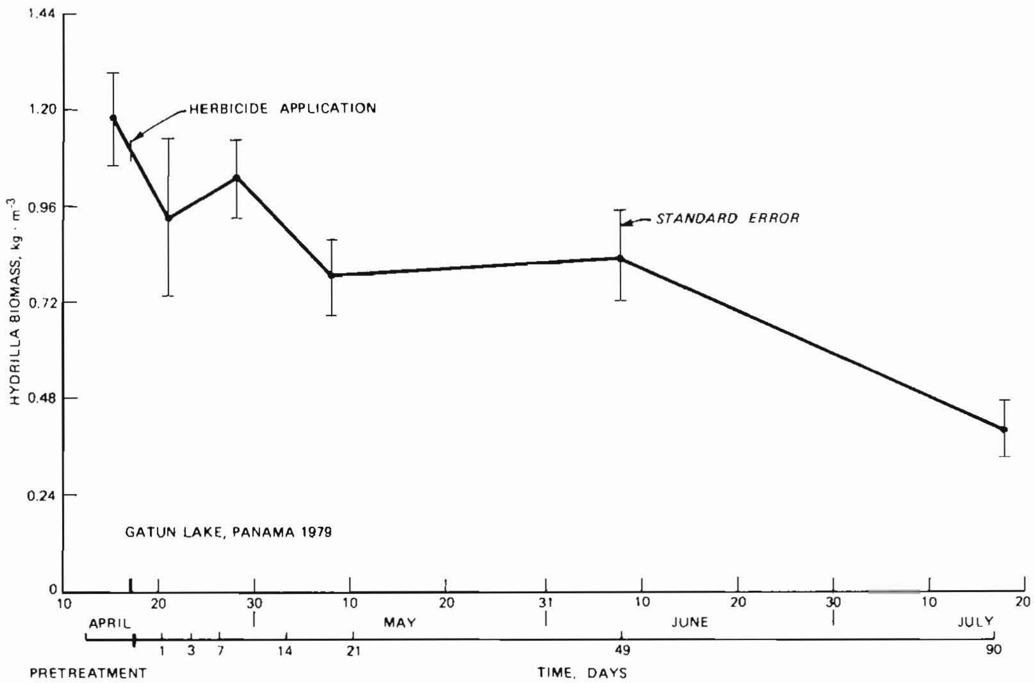

Figure 14. Hydrilla biomass of REF-4 during the 90-day posttreatment study period

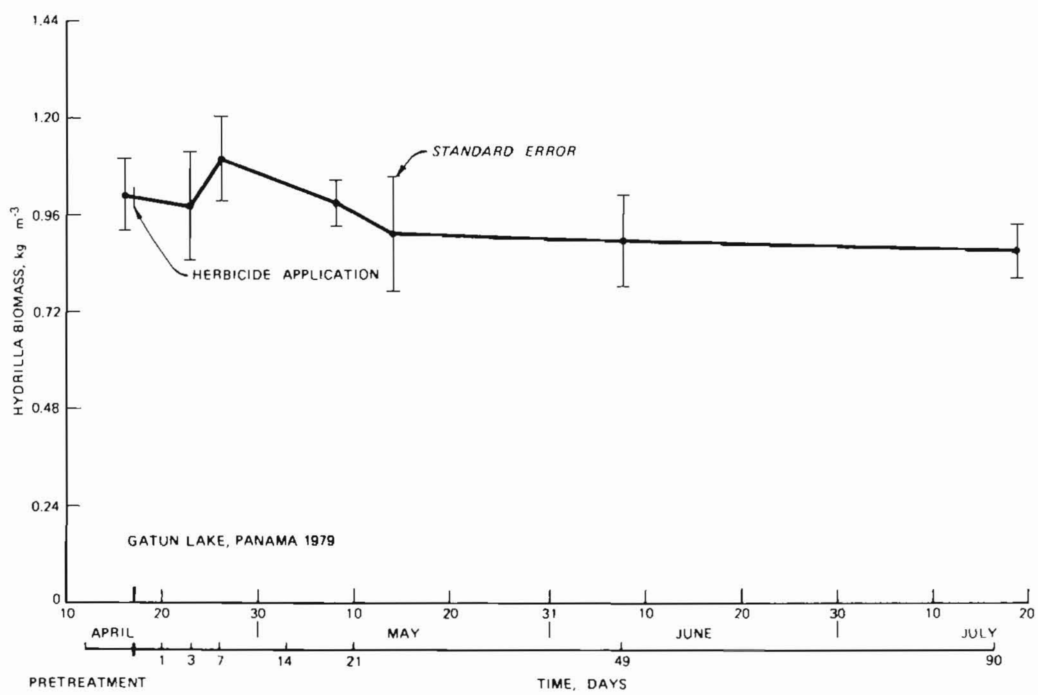

Figure 15. Hydrilla biomass of REF-8 during the 90-day posttreatment study period

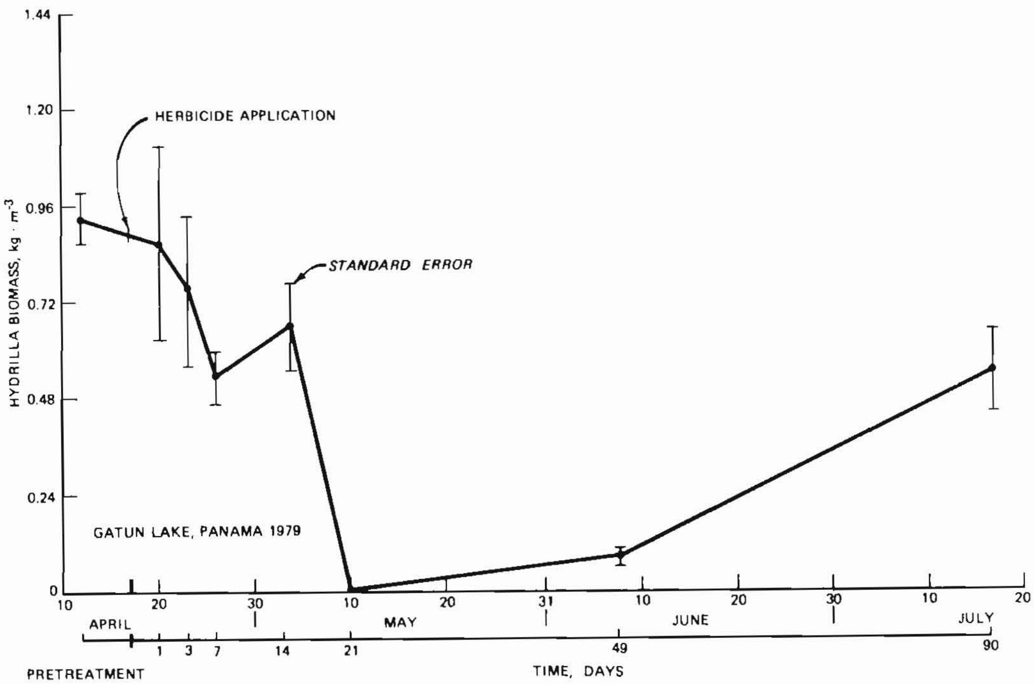

Figure 16. Change in hydrilla biomass of TRT-1 following treatment with 75 ℓ/ha (0.7 ppm a.e.) of the liquid dipotassium salt of endothall

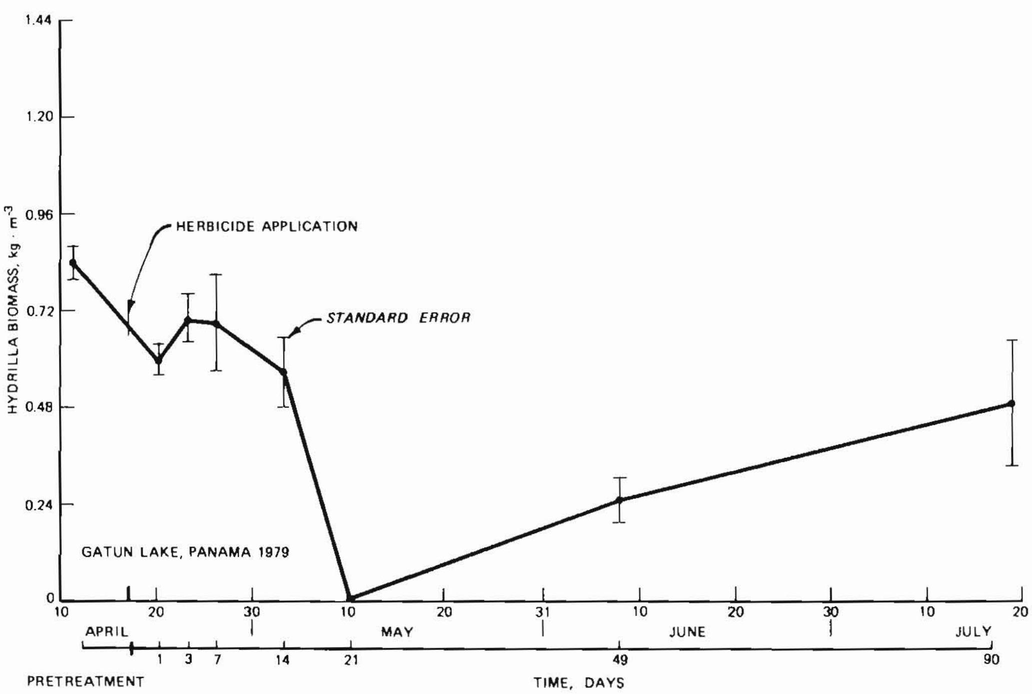

Figure 17. Change in hydrilla biomass of TRT-6 following treatment with 93 ℓ/ha (0.6 ppm a.e.) of the liquid dipotassium salt of endothall

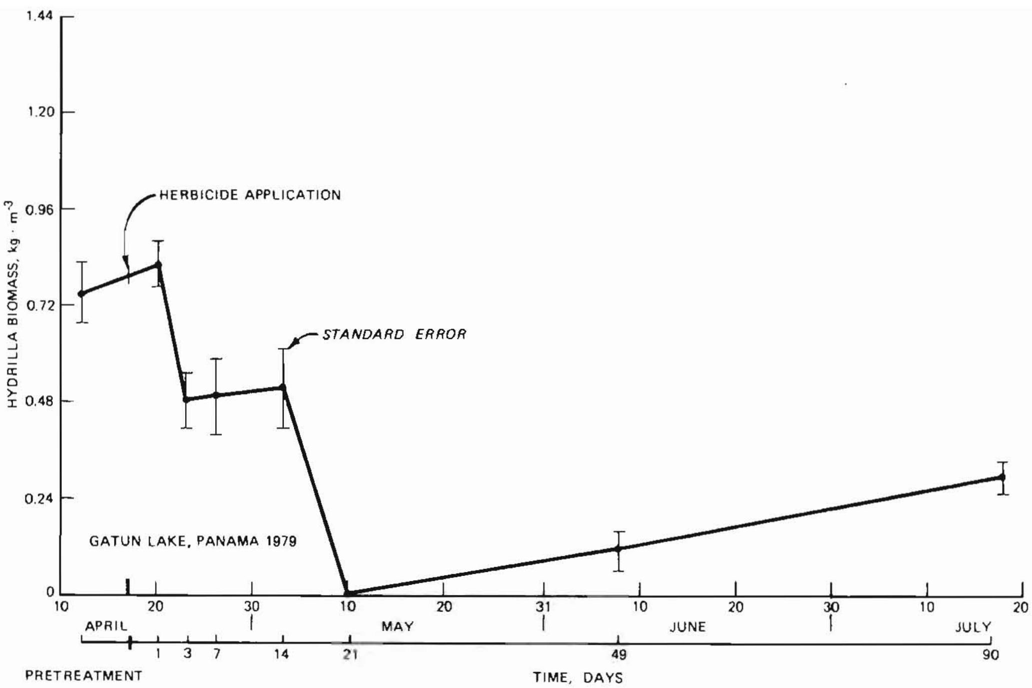

Figure 18. Change in hydrilla biomass of TRT-5 following treatment with 140 ℓ/ha (1.1 ppm a.e.) of the liquid dipotassium salt of endothall

flaccid. Moreover, new hydrilla growth, approximately 0.3 m in length, was observed at scattered locations throughout each treatment plot. It appeared that some of the new growth originated from the sediment and nodes of hydrilla which were lying on the bottom of the lake.

36. Progression of hydrilla regrowth was observed. On posttreatment day 49, only sparse hydrilla regrowth from the shoreline toward deeper water was evident along the shoreline of TRT-1, -6, and -5. However, on posttreatment day 90, dense hydrilla growth was observed along the shoreline of these plots and within 1 to 2 m of the water surface in scattered shallow areas of each plot. After 4 months posttreatment, the hydrilla in TRT-1, -6, and -5 had nearly recovered to pretreatment levels. At this time no visible hydrilla was evident in the deepwater locations of each plot, but hydrilla regrowth was verified by dragging an anchor in these areas.

37. A one-way analysis of variance (ANOVA) followed by the

application of the t-test was used to determine when the hydrilla biomass of each treatment plot had decreased significantly compared to REF-8 during the 90 days posttreatment (Table 3). By posttreatment day 3 and throughout the 90-day posttreatment study period, the mean hydrilla biomasses of TRT-1 and -5 were statistically lower ($P < 0.10$) compared to REF-8. The hydrilla biomass in TRT-6 was not statistically different from REF-8 until posttreatment day 21 ($P < 0.008$). However, no statistical difference between TRT-6 and REF-8 was noted on posttreatment day 49. Divers observed the hydrilla on the sediment surface in TRT-6 to be stacked as mounds up to 2 m high. The biomass sampler was lowered through several of these mounds at a few of the randomly selected sampling stations; hence, atypically high mean plant biomass levels and standard errors (SE) were recorded on posttreatment day 49, compared to TRT-1 and -5.

38. In summary, the hydrilla in TRT-1, -6, and -5 was controlled effectively within the treated areas at all rates of application. However, prior to noticeable decomposition of the previously treated hydrilla standing crop, regrowth was observed originating from some hydrilla nodes and sediment. TRT-1, -6, and -5 had reestablished to pretreatment levels within 4 months posttreatment.

Hydout: TRT-3, -7, and -2

39. The response of hydrilla in TRT-3, -7, and -2 to the dimethylalkylamine formulation of endothall was much different (Figures 19-21). No obvious deterioration of the plant tissue was observed until posttreatment day 14. Only the leaves and stem near the tip of the apical meristems were brown and translucent. Buoyancy of the hydrilla mat was not affected. However, by posttreatment day 14, the hydrilla in TRT-2 began to settle and was approximately 1 to 2 m below the water surface. Higher DO concentrations within the hydrilla surface mat through posttreatment day 11 of TRT-3, -7, and -2 suggested that little or no damage to the hydrilla had occurred by this time. Most of the hydrilla in TRT-7 and -3 remained at the water surface; however, significant defoliation of the hydrilla was observed in TRT-3, -7, and -2 through posttreatment day 49. TRT-7 was clear of hydrilla except for

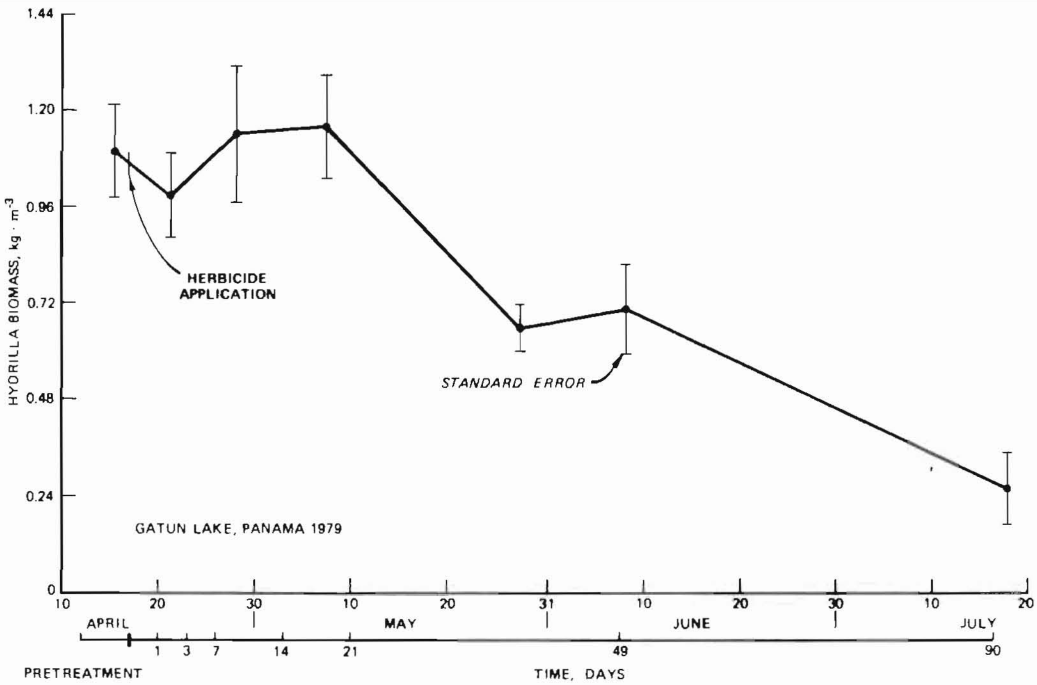

Figure 19. Change in hydrilla biomass of TRT-3 following treatment with 269 kg/ha (0.6 ppm a.e.) of the pelletized dimethylalkylamine salt of endothall

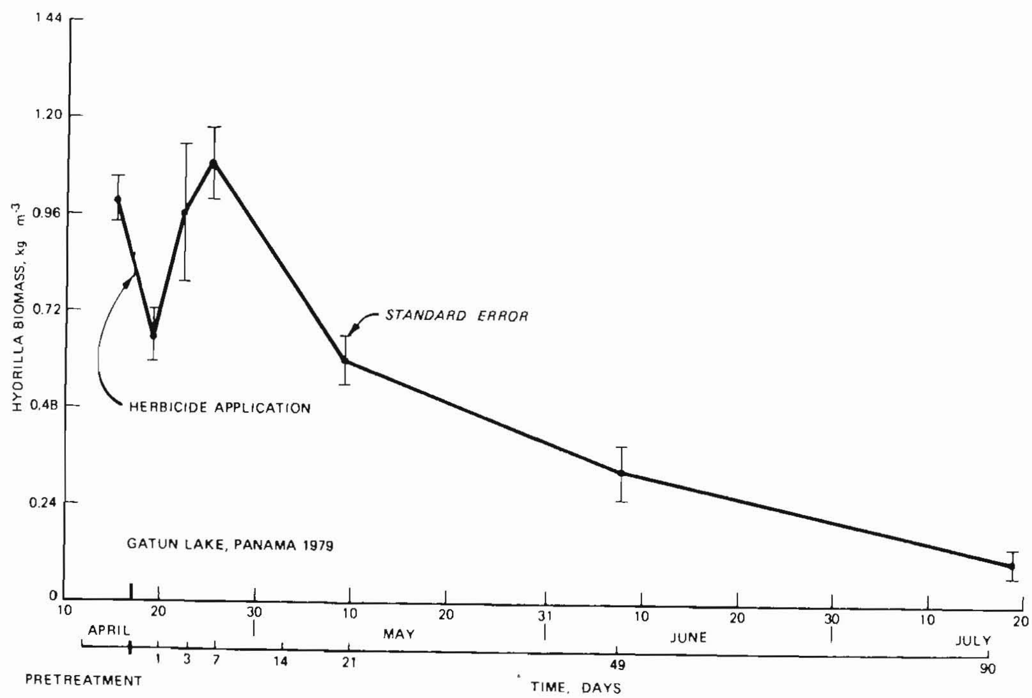

Figure 20. Change in hydrilla biomass of TRT-7 following treatment with 366 kg/ha (0.9 ppm a.e.) of the pelletized dimethylalkylamine salt of endothall

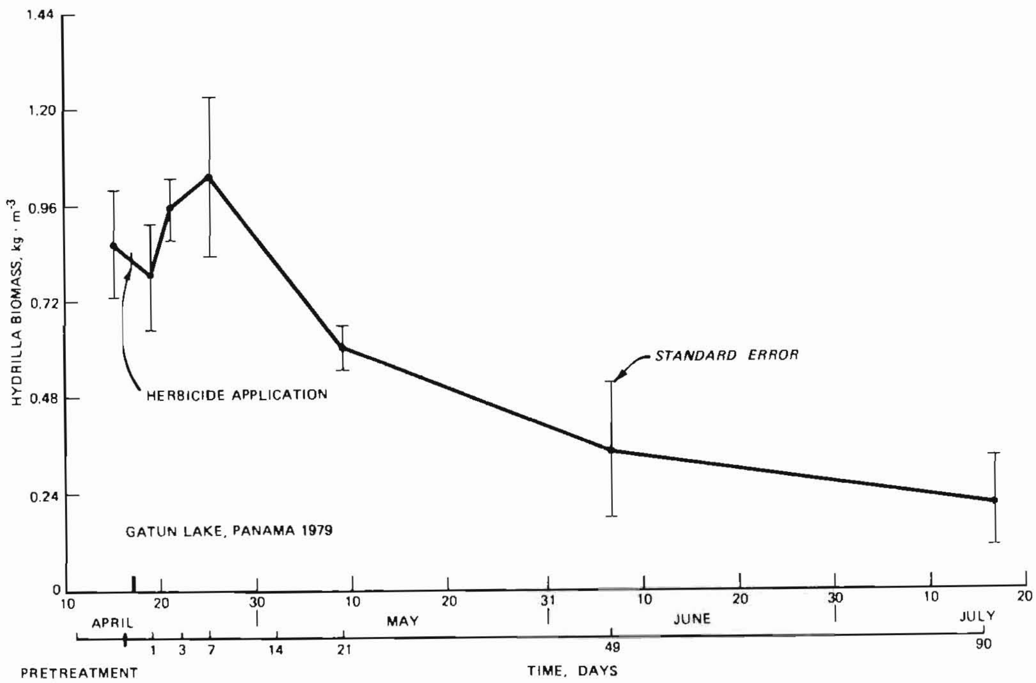

Figure 21. Change in hydrilla biomass of TRT-2 following treatment with 504 kg/ha (1.1 ppm a.e.) of the pelletized dimethylalkylamine salt of endothall

along the shoreline. Evidence of hydrilla regrowth was not apparent in TRT-3, -7, and -2 throughout the 90-day posttreatment study period. In TRT-2, a dense formation of *Ceratophyllum* sp. (coontail) appeared from the middle of the plot northward along the shoreline after 21 days posttreatment.

40. At approximately 150 days posttreatment, hydrilla was at the water surface in the northern section of TRT-3, i.e. 30 percent of the total surface area. Hydrilla was approximately 1 to 2 m below the water surface over most of the remaining area. Hydrilla regrowth in TRT-7 was not uniform nor very extensive. Actively growing hydrilla was not evident in many areas of this plot. Hydrilla regrowth in TRT-2 was extensive in the shallow areas, i.e. water less than 3 m deep. Throughout the deeper areas, extensive hydrilla regrowth was found at 4 to 5 m below the water surface. Hydrilla had essentially grown up to the water surface over the entire surface area of TRT-2, and to within 0.2 m of

the water surface in TRT-3. *Ceratophyllum* sp. declined as the hydrilla continued to grow in TRT-2. Approximately 35 percent of TRT-3 contained only tangled masses of defoliated hydrilla and the entire surface area of TRT-7 was clear, but dense hydrilla regrowth was just below the water surface.

41. Results of the t-test comparing hydrilla biomass of each treatment plot with REF-8 showed that a significant biomass change ($P < 0.10$) occurred on posttreatment day 21 for all treatments. However, it appeared that, on posttreatment day 49, a significant difference was not apparent in TRT-3. As stated previously, the hydrilla was stacked in mounds and several biomass samples were taken from these mounds. Higher hydrilla biomass levels were measured than what would normally represent the actual condition. This stacking effect was observed by divers to some extent in the treated plots. By posttreatment day 90, nearly complete degradation of the hydrilla was observed in TRT-3, -7, and -2 using the biomass sampler. Since the biomass sampler relies on the buoyancy of the plant tissue to remain in the cylindrical bucket, plants in advanced decomposition would not be buoyant. Therefore, the hydrilla would tend to settle out of the bucket as the cutting edge advanced downward. If the sampler was lowered through the aforementioned hydrilla mounds, the hydrilla in the bucket would be blocked from settling out by the hydrilla below.

Herbicide Residue--Water

Reference plots

42. From Figure 22 and Appendix C, it was apparent that endothall drifted from TRT-3 into REF-4 over the first several days. Consequently, REF-4 was not considered to be a satisfactory reference plot for comparing test results. For REF-8, only two water samples from posttreatment day 4 and one water sample from day 8 contained detectable endothall residues, suggesting sample contamination or herbicide dispersion into this plot. This was not considered too significant because the

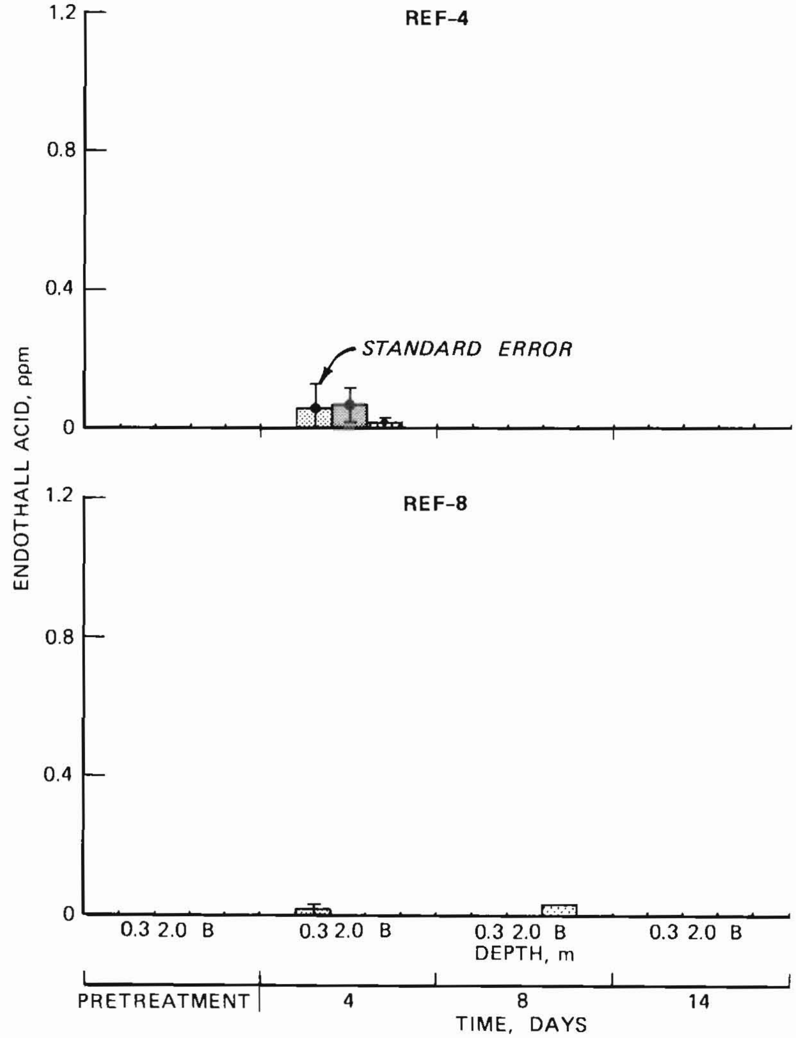

Figure 22. Endothall residue in water from REF-4 and -8

endothall concentrations in hydrilla tissue and sediment were below detection limits as opposed to REF-4.

Aquathol K: TRT-1, -6, and -5

43. Figure 23 shows the rapid disappearance of endothall from TRT-1, -6, and -5 following application at 27, 34, and 50 kg a.e./ha, respectively. Within 24 hr following treatment, the mean endothall concentrations were approximately 66 percent of the estimated initial concentration and substantial differences existed in the herbicide distribution throughout the water column. After approximately 3 days posttreatment, endothall acid residues were detected throughout the water column; however, less than 0.10 ppm a.e. endothall remained in TRT-6 and

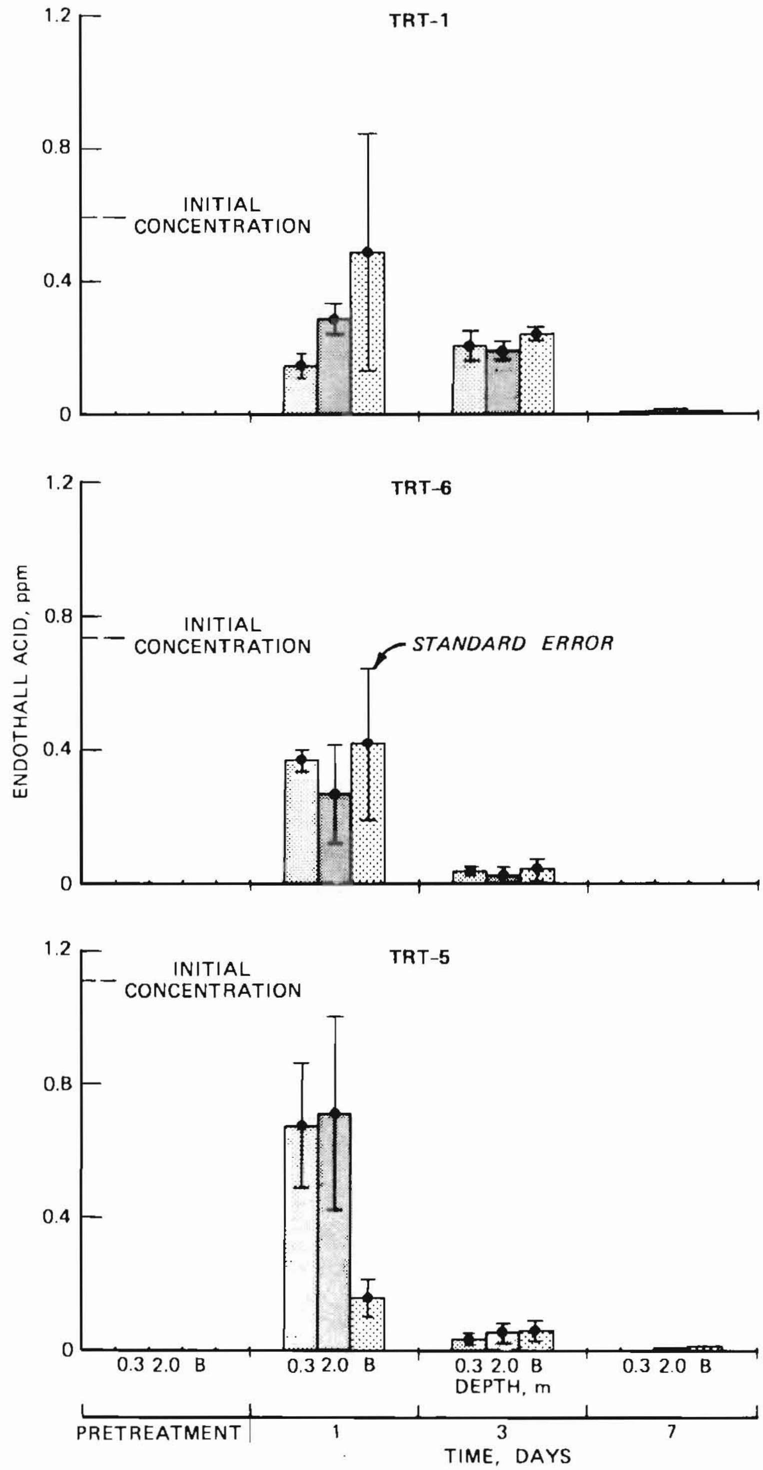

Figure 23. Endothall residue in water from TRT-1, -6, and -5 treated with the dipotassium salt of endothall

-5 and approximately 0.2 ppm a.e. endothall remained in TRT-1. By posttreatment day 7, less than 0.01 ppm a.e. endothall was detected in the water column. A spot check of water samples collected on subsequent sampling dates confirmed that the endothall concentration was less than 0.01 ppm a.e.

44. Water samples collected in the buffer areas around each plot (Appendix C) contained endothall concentrations of 0.01 to 0.10 ppm a.e. during the first 3 days following treatment. Highest residue concentrations were found at the 2.0-m depth, which corresponded to the approximate depths of the weighted, trailing hose that was used for application of this formulation. Endothall residues in water from the buffer areas did not persist longer than 3 days following treatment with the dipotassium endothall formulation.

45. Table 4 lists the significance levels for P-values obtained from an ANOVA to determine if temporal changes in the mean endothall acid concentration in water occurred during the posttreatment study period. The P-values from REF-4 and -8 are listed for comparison. The relatively small sample size resulted in a very insensitive statistical test. Only the P-values representing TRT-6 and -5 were statistically significant. At the 0.3-m water depth there was an immediate increase in the endothall concentration in both TRT-6, and -5 within 24 hr following treatment, and by posttreatment day 4 endothall residues were below detection limits (<0.01 ppm a.e.). This reduction in endothall concentrations coincided with the sinking of the hydrilla mat below the 0.3-m water depth, allowing more rapid dispersion of available endothall out of the treated area. The lower than planned initial concentrations of endothall in TRT-1 and -6 and the dispersion of the herbicide into the buffer zones around each plot contributed to the very low endothall concentrations observed after 24 hr posttreatment and subsequently lower values throughout the study period. The statistically significant P-value for the buffer zone around TRT-6 at the 2.0-m water depth and the high endothall concentration measured after 24 hr posttreatment are evidence that endothall dispersed rapidly as a density flow into the untreated buffer zone. Moreover, only 30 to 60 percent of the endothall

applied initially was measured after 24 hr, further suggesting that the remaining endothall was rapidly absorbed by the macrophytes and phytoplankton or drifted out of the treated area. Similar changes in the mean endothall concentration of TRT-1 were shown; however, the magnitude of the change was not statistically significant.

Hydout: TRT-3, -7, and -2

46. This pelletized endothall formulation gradually decomposed, thereby releasing endothall from the pellet to the water. However, the endothall release rate was much slower than anticipated. Mean endothall concentrations remained low through posttreatment day 21 (Appendix C). A treatment rate of 0.6 ppm a.e. to TRT-3 resulted in a maximum of 0.1 to 0.18 ppm a.e. being detected through posttreatment day 3 (Figure 24). Less than 0.06 ppm a.e. was detected on posttreatment days 7 and 14 throughout the water column of TRT-3. However, endothall concentrations in TRT-7 decreased rapidly at the 0.3- and 2.0-m water depths through posttreatment day 14. Unlike TRT-3 and -2, endothall levels in the bottom water samples of TRT-7 increased through posttreatment day 7, indicating a downward density flow of endothall. The endothall concentration in TRT-2 at 0.3 and 2.0 m below the water surface and at 0.5 m above the sediment remained constant through day 7 at about 0.18 ppm a.e. By posttreatment day 14, very low endothall concentrations were observed at 0.5 m above the sediment of each plot. The maximum mean endothall concentration observed in TRT-3, -7, and -2 was 0.18 ppm a.e., representing only 10 to 30 percent of the estimated initial treatment concentration for each plot. The bulk of the herbicide apparently sank into the organic silt based on the high levels measured in the sediment at this time (Appendix C).

47. Table 5 lists the significance levels obtained from an ANOVA for evaluating whether significant changes in the mean endothall concentrations as measured at different water depths occurred during the study period. As previously stated, the small sample size resulted in an insensitive statistical test. Similar to the dipotassium salt formulation, a statistically significant change was found in the endothall concentration at all depths in TRT-2 through the 14-day posttreatment

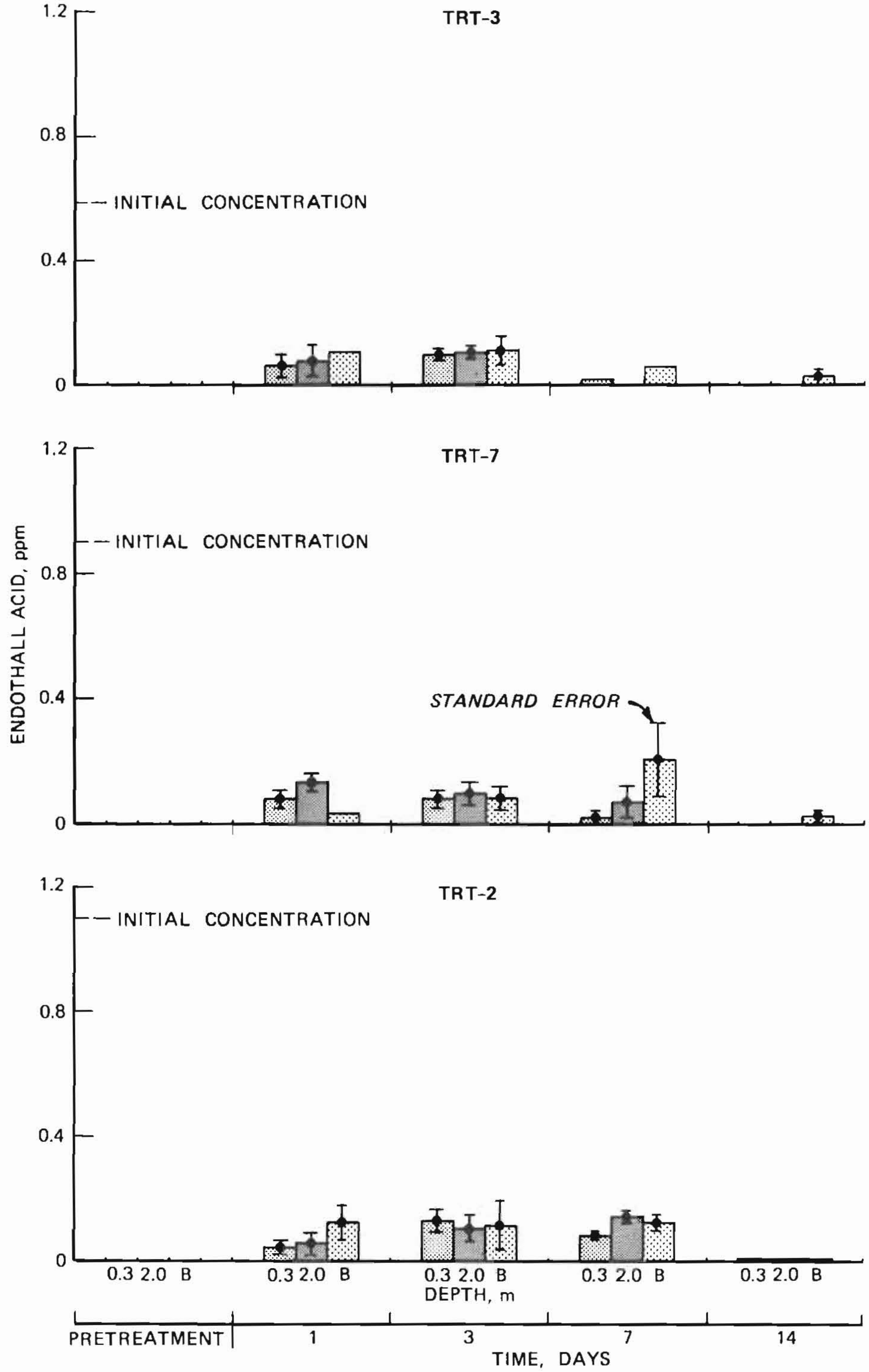

Figure 24. Endothall residue in water from TRT-3, -7, and -2 treated with the pelletized dimethylalkylamine salt of endothall

study period. This was attributed to the initially high endothall concentration washed from the pellet's surface following treatment and subsequent minor contributions from the decomposing pellets resting on the hydrilla foliage. Unlike the dipotassium salt formulation, less than 30 percent of the endothall applied initially was available after 24 hr, suggesting a slow release of endothall from the pellets.

48. The endothall concentrations were low in the water column throughout the sampling period. Moreover, no statistically significant change in endothall concentrations of TRT-7 could be detected. Consequently, sample variance within each plot must be considered as a major factor influencing these results. Temporal changes in the mean endothall concentrations in water from TRT-2 were statistically significant at 0.3 and 2.0 m below the water surface, and at 0.5 m above the sediment surface through posttreatment day 7.

49. Results of this analysis suggest that the dimethylalkylamine formulation released endothall very slowly to the water. The slow release was attributed to the herbicide pellets sinking into the organic silt and the endothall being released to the overlying water by diffusion through the silt. The slower release of the endothall probably reduced the rate of herbicide dispersion out of the treated area.

Herbicide Residue--Sediment

50. Endothall was not measured in sediment samples collected from all eight plots prior to treatment because herbicide residues were not found in pretreatment water and plant samples. The sediment endothall residue data are listed in Appendix C.

Reference plots

51. No detectable endothall levels (i.e. >0.01 ppm a.e.) were observed in sediment samples from REF-4 and -8.

Aquathol K: TRT-1, -6, and -5

52. The mean endothall concentrations in sediment from TRT-1, -6, and -5 were considered low through the first 3 days posttreatment and nondetectable thereafter (Figure 25). Only one sample obtained 1 and

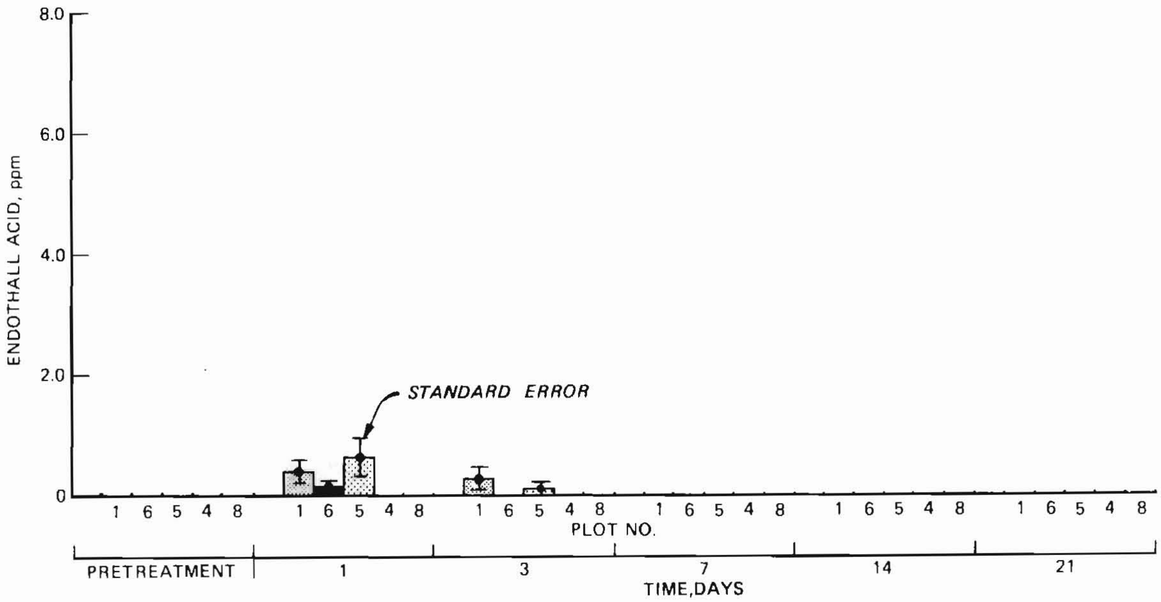

Figure 25. Endothall residue in sediment from TRT-1, -6, and -5 and REF-4 and -8

3 days posttreatment from TRT-1 and -5, respectively, contained approximately three to four times more endothall than the other sediment samples taken within these treated plots (Appendix C). This sample was obtained from a bottom depression where endothall may have accumulated as it settled out of the water column.

53. Results of the ANOVA (Table 6) for TRT-1, -6, and -5, when considering the variation in sediment endothall concentrations (Appendix C), suggest that the differences were neglible among mean endothall concentrations for these plots over the 7-day posttreatment sampling period. Approximately 24 hr following herbicide application, low levels of endothall were detectable in the sediments from each plot. It was apparent from the data that the low sediment endothall concentrations were transitory.

Hydout: TRT-3, -7, and -2

54. Results of endothall residue analyses are presented in Appendix C and summarized in Figure 26. Unlike the dipotassium salt formulation, much higher mean endothall concentrations were detected in sediment samples over the 21-day posttreatment sampling period. Mean

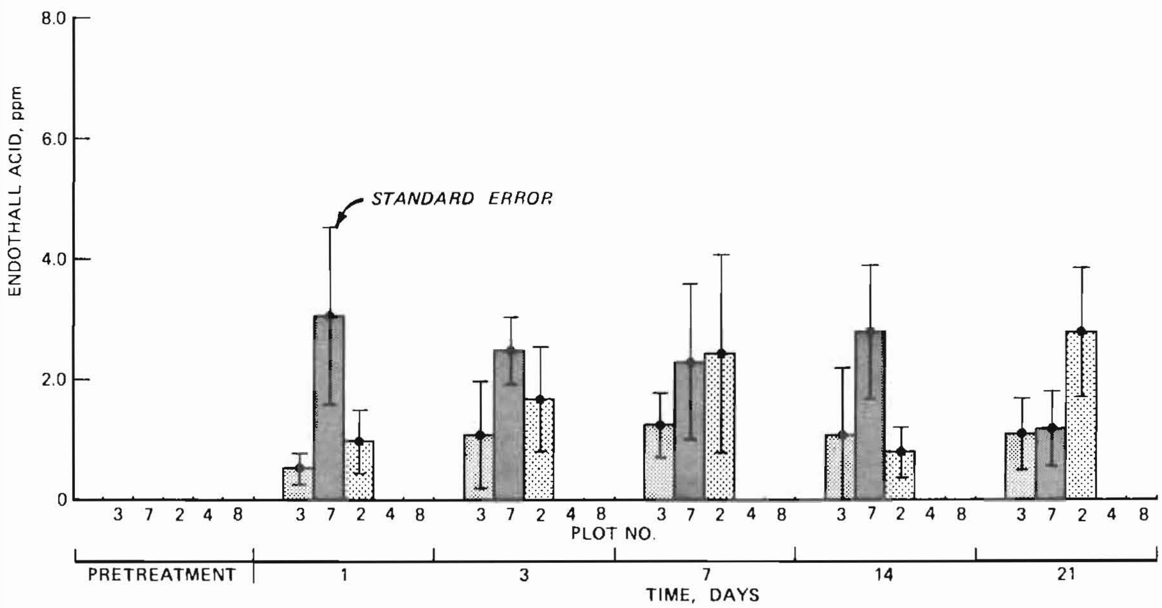

Figure 26. Endothall residue in sediment from TRT-3, -7, and -2 and REF-4 and -8

endothall concentrations of 1.0 to 3.0 ppm a.e. remained throughout the 21-day sampling period in TRT-3, -7, and -2.

55. From the results of the ANOVA (Table 6), no statistically significant change ($P < 0.05$) in the sediment mean endothall concentrations of TRT-3, -7, and -2 occurred throughout the 21-day posttreatment sampling period. The endothall concentrations in the sediment remained significantly high, i.e. >1.0 ppm a.e., for more than 21 days. Endothall may have diffused from the sediment of TRT-3 into the overlying water and subsequently drifted into REF-4 thereby effecting the control of hydrilla in the reference plot observed after posttreatment day 49.

Herbicide Residue--Plant

Reference plots

56. Detectable endothall concentrations were observed in REF-4 within 24 hr following application of the dimethylalkylamine endothall formulation to TRT-3 (Figure 27 and Appendix C). As previously stated, endothall was apparently dispersed from TRT-3 into REF-4 during and following treatment. Mean endothall concentrations were approximately 0.1

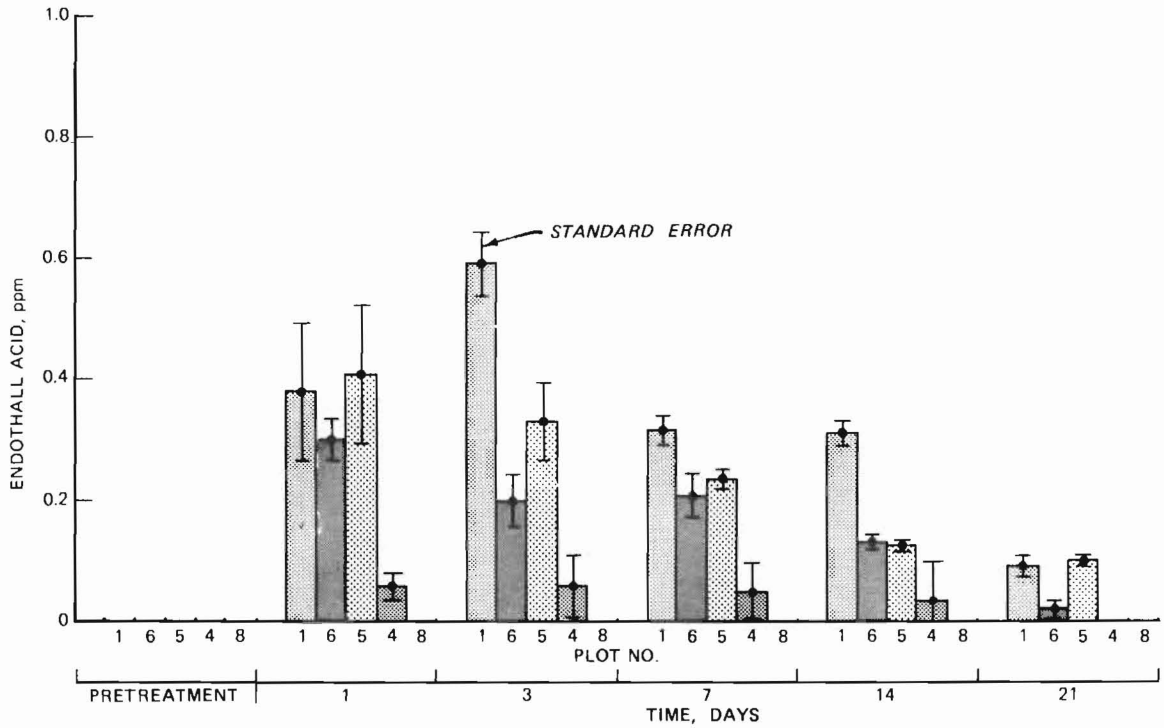

Figure 27. Endothall residue in hydrilla from TRT-1, -6, and -5 and REF-4 and -8

to 0.2 ppm through posttreatment day 14 and below detection limits (>0.01 ppm a.e.) by posttreatment day 21. As a result, REF-4 was not considered for comparative analyses of results with the treated plots.

57. The results of an ANOVA are listed in Table 7 showing the mean endothall concentration for each sampling day and the significance levels. There appears to be a gradual reduction in the mean endothall concentration of REF-4 from days 3 through 21; however, the variation about the mean was too great to show statistical significance. Endothall residues in hydrilla from REF-8 were not found to be above the 0.01-ppm a.e. detection limit throughout the study period. Therefore, REF-8 was considered to be the primary reference plot for comparing results to the treated areas.

Aquathol K: TRT-1, -6, and -5

58. Endothall was rapidly absorbed by hydrilla immediately following application, i.e. within 24 to 72 hr (Appendix C). The mean endothall concentration in hydrilla tissue from TRT-1, -6, and -5

declined gradually over the 21-day posttreatment sampling period (Figure 27). Though endothall (0.1 to 0.3 ppm a.e.) remained in hydrilla tissue throughout the 21-day period, endothall concentrations were nondetectable in the water after posttreatment day 3. Metabolism of endothall by the hydrilla and microorganisms was gradual; however, there was no indication of a sudden endothall release into the water. Rapid dispersion of endothall within 24 hr throughout the water column following treatment permitted its absorption over the entire plant surface resulting in rapid uptake of the applied endothall from the water. The disappearance of endothall from water coincided with the decline of the hydrilla standing crop within 48 to 72 hr following treatment.

59. The ANOVA showed that there was a significant change in mean endothall concentrations within the hydrilla during the posttreatment sampling period (Table 7). Significance (P J 0.05) was shown for TRT-1, -6, and -5, thereby verifying that endothall was rapidly accumulated by the hydrilla initially, followed by a gradual decline through posttreatment day 21.

Hydout: TRT-3, -7, and -2

60. High endothall concentrations in hydrilla were measured within 24 hr following application to TRT-3, -7, and -2 (Appendix C) and remained relatively constant through posttreatment day 21 (Figure 28). The maximum mean endothall concentration found in hydrilla from TRT-3, -7, and -2 ranged from approximately 0.4 to 0.6 ppm a.e., which is similar to that found for TRT-1, -6, and -5. Likewise, relatively high endothall concentrations remained in the hydrilla tissue through posttreatment day 21 though the endothall levels in the water were nondetectable.

61. The large standard error of the mean suggested a varying availability of the endothall to hydrilla treated with this formulation. The herbicide-impregnated clay pellets were designed to slowly release the endothall as the pellets decomposed. It appeared that the rate of decompostion was affected primarily by the rate of water movement around the pellet and the proximity of the pellets to the water-sediment interface. Endothall uptake by hydrilla tissue was mediated by the availability of enothall released by the pellets.

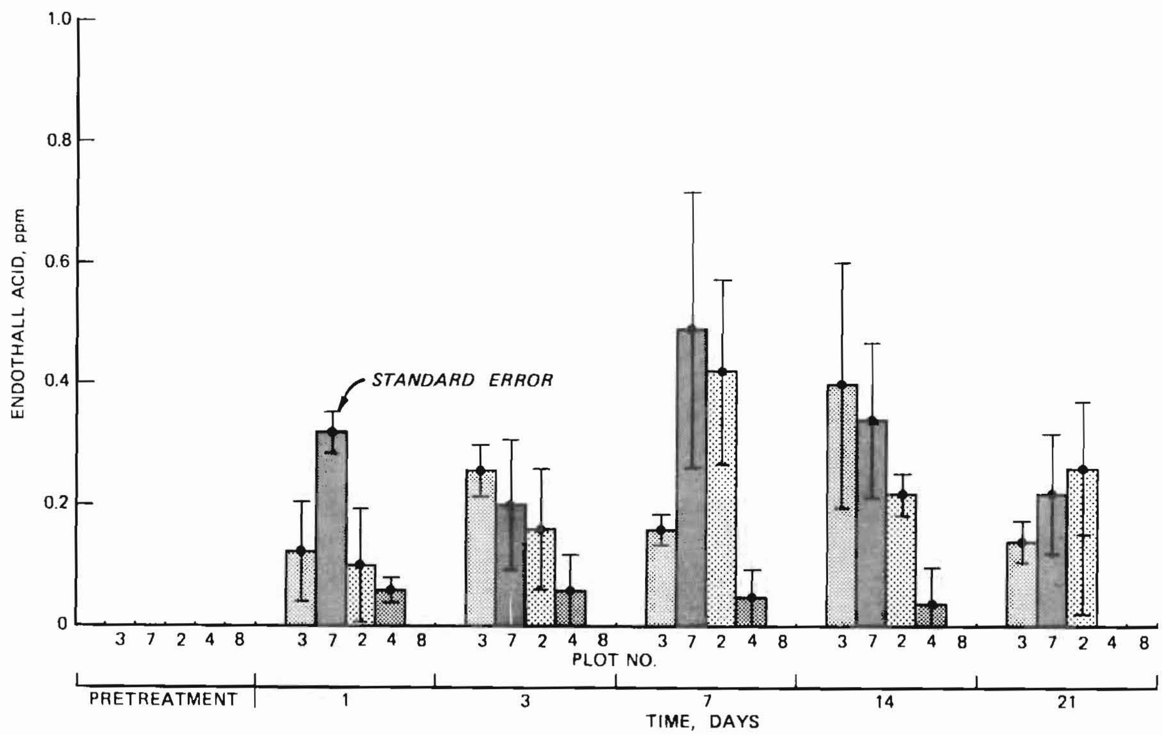

Figure 28. Endothall residue in hydrilla from TRT-3, -7, and -2 and REF-4 and -8

62. Results of the ANOVA showed that no statistically significant change occurred in the mean endothall concentrations measured in hydrilla over the 21-day posttreatment study period (Table 7). The large SE for TRT-3, -7, and -2 contributed to the insensitivity of this analysis to changes in mean endothall concentration. The slow endothall release from the clay pellets over several days and the continued uptake of endothall by the hydrilla through posttreatment day 14 resulted in a broad range of endothall concentrations being observed within each plot throughout the 21-day posttreatment study period.

Water Quality

63. The indirect effects of endothall treatments on selected water quality parameters are summarized in Table 8. The actual data representative of each plot and respective buffer zone are tabulated in Appendix D.

Water temperature

64. The vertical water temperature profile was measured at 0.3, 1.0, and 2.0 m below the water surface and 0.5 m above the bottom sediment. Water temperature at the surface was approximately 29°C throughout the study. The high humidity and small diurnal air temperature fluctuations in this tropical, equatorial region along with nearly constant year-round solar radiation, contribute significantly to the near uniform vertical water temperature profile (Fernando 1980). Consequently, the addition of endothall and subsequent control of hydrilla in TRT-1, -2, -3, -5, -6, and -7 had virtually no effect on the water temperature profile.

Conductivity

65. No change in conductivity was observed following treatment with either the dipotassium salt or the dimethylalkylamine salt formulations of endothall. The conductivity in the reference plots remained constant throughout the study.

Dissolved oxygen

66. The application of dipotassium endothall to TRT-1, -6, and -5 resulted in an immediate decrease in the percent DO saturation between posttreatment days 1 and 3 (Figure 29) illustrating endothall's probable impact on photosynthetic processes of phytoplankton and hydrilla. Between posttreatment days 3 and 7, there was a slight increase in percent DO saturation at 1.0 and 2.0 m below the water surface for TRT-1, -6, and -5 resulting from continued photosynthesis by hydrilla as the hydrilla mat descended through the water column. As will be discussed later, pelagic phytoplankton did not appear to significantly affect DO levels in the open water. The percent DO saturation at 0.3, 1.0, and 2.0 m below the water surface of TRT-1, -6, and -5 remained constant or increased slightly after posttreatment day 7. The buffer zones of TRT-1, -6, and -5 showed trends similar to their corresponding treatment plots (Appendix D). Moreover, the percent DO saturation was lowest near the water-sediment interface between posttreatment days 7 and 14 for TRT-1, -6, and -5 then increased near the water-sediment interface of TRT-1 and -6 after posttreatment day 14.

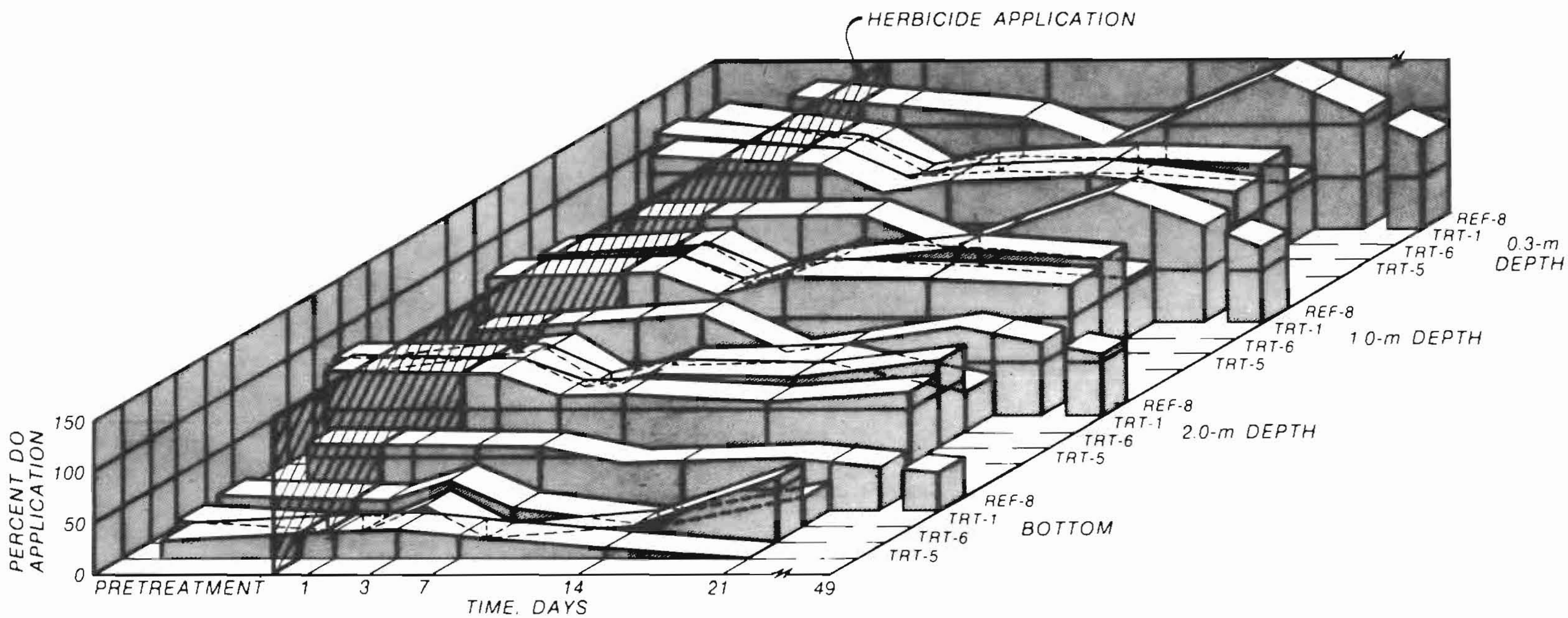

Figure 29. Comparison of percent DO saturation by water depth between TRT-1, -6, and -5 and REF-8

67. Herbicidal activity was much slower in TRT-3, -7, and -2 than in TRT-1, -6, and -5 because of the aforementioned differences in release rate and availability of endothall to the hydrilla following herbicide application. The application of dimethylalkylamine endothall to TRT-3, -7, and -2 had little, if any, immediate effect on mean DO levels at 0.3, 1.0, and 2.0 m below the water surface (Appendix D). The percent DO saturation in TRT-3 and -7 remained unchanged at similar depths through posttreatment day 21 (Figure 30) and declined rapidly thereafter near the water-sediment interface of TRT-3, -7, and -2. Endothall application to TRT-2, i.e. 50 kg a.e./ha, resulted in a significant DO reduction by posttreatment day 21 at 0.3, 1.0, and 2.0 m below the water surface. Reduction in DO was caused by decreased photosynthetic activity of the aquatic plant community. The percent DO saturation response and the qualitative and quantitative changes in hydrilla biomass, as previously described for each treatment plot, paralleled quite closely.

68. The percent DO saturation levels for REF-4 and -8 remained nearly constant at 0.3, 1.0, and 2.0 m below the water surface through posttreatment day 21 (Appendix D). The percent DO saturation near the water-sediment interface of REF-8 remained constant (Figure 29 or 30); however, a steady decline was observed for REF-4 (Appendix D).

pH

69. The pH declined slightly in TRT-1 and -2 and their respective buffers (Appendix D and Table 8). This was probably a result of rainfall in the Frijoles watershed providing lower pH runoff to Frijoles Bay. The onset of the rainy season had begun by the time this study had been initiated and afternoon showers were expected almost every day in the watershed. Slight fluctuations in pH were observed resulting from increased respiration and decreased photosynthetic activity following herbicide application.

Turbidity

70. Turbidity in the study area was composed primarily of organic detritus. As measured using a turbidimeter, the turbidity decreased slightly compared to pretreatment levels in the surface 2 m of water depth and increased near the water-sediment interface following

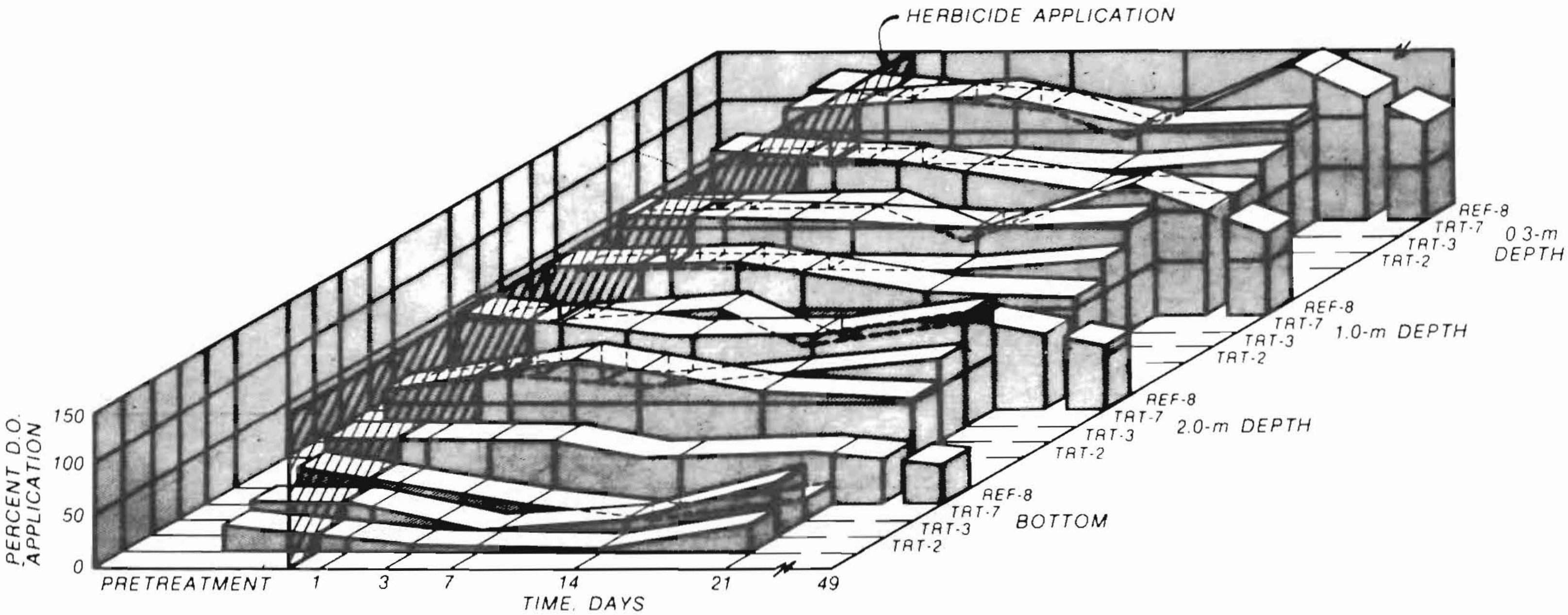

Figure 30. Comparison of percent DO saturation by water depth between TRT-3, -7, and -2 and REF-8

application of the two endothall formulations (Table 8). Reduction in turbidity probably resulted from settling of the hydrilla and associated planktonic communities. Significant increases in turbidity were observed in the bottom water samples by posttreatment day 7 in TRT-1 and -3, day 21 in TRT-6, and day 49 in TRT-5. An apparent sharp increase in turbidity was measured in water samples obtained at 0.5 m above the sediment in REF-4 by posttreatment day 7. No changes were detected in REF-8 from pretreatment levels.

Biochemical oxygen demand

71. A very low biochemical oxygen demand was measured at all water depths, i.e. 0.3, 1.0, 2.0, and 3.0 m below the water surface (Table 8). A very slight increase was evident in all plots following endothall application through posttreatment day 7. Generally, the magnitude of change was considered negligible and probably resulted from an increase in suspended organic detritus contributed by the affected hydrilla.

Ammonia

72. The ammonia data were very erratic and demonstrated no trends, probably because there was rapid microbial uptake of ammonia from the water (Table 8). The highest levels (0.06 to 0.17 ppm a.e.) were found in unfiltered water samples from TRT-1, -3, and -5.

Total Kjeldahl nitrogen, TKN

73. Very low levels (approximately 0.10 ppm a.e. or less) of TKN were detected in the unfiltered water samples of all plots representing the 0.3- and 2.0-m water depth (Table 8). Only water samples from 0.5 m above the sediment of TRT-1 and -5 and their respective buffer areas showed a slight increase in TKN by posttreatment days 14 and 21, i.e. 0.16 to 0.20 ppm a.e.

Total phosphate

74. Highest T-PO_4 concentrations (0.04 to 0.08 ppm a.e.) were measured at 0.5 m above the sediment in TRT-1, -5, and -7 and REF-4 between posttreatment days 7 and 21 (Table 8). No evidence of increased T-PO_4 release was found in plots treated with the dimethylalkylamine endothall formulation.

Hardness and alkalinity

75. These data (Table 8) confirm that Gatun Lake is a softwater lake with a very low alkalinity and thus quite susceptible to the contact herbicide. The coating of plant tissue with bicarbonates, as typical of hardwater lakes in the United States, renders stems and leaves more impermeable to endothall (Yeo 1964).

Color

76. The higher color in the bottom water samples (Table 8) of all treatment and reference plots was caused by organic substances in solution. The flocculant organic sediment of more than 1 m thick, typical throughout most of these plots, probably served as the primary source for the color. However, slightly higher mean values were found after posttreatment day 7 in the bottom water samples from TRT-1, -2, -3, -5, -6, and -7. The increased color may have been caused by the mode-of-action of endothall whereby cellular components were broken down permitting leaching of physically bound organic acids from the surficial sediment and decomposing plant tissue.

Phytoplankton

77. Using cell-pack volume as a parameter to indicate significant change in community structure, a t-test was used to compare treatment plots with the reference plots. Table 9 represents the t-test values for comparing the mean cell-pack volume of each plot to REF-8 during the evaluation period. Results of this test suggest that a significant change in community structure occurred between posttreatment days 21 and 49. The statistical significance exhibited in REF-4 and TRT-5 when compared with REF-8 for the pretreatment sampling period is difficult to explain, possibly a result of natural variability between the plots prior to treatment. The water samples from each treatment plot on posttreatment day 49 contained predominantly filamentous algae which did not compact very well during centrifugation. Hence, the cell-pack volumes were found to be much higher than previously measured. The predominant change in the planktonic community structure was toward the predominance

of filamentous mat-forming algae and larger sized phytoplankton and zooplankton organisms. At no time was there a pelagic algal bloom in the water column of any plot.

78. The phytoplankton taxa in water samples composited by depth from five locations within each plot to represent 0.3 and 2 m below the water surface and 0.5 m above the sediment are listed in Appendix E. Only those organisms which responded to the herbicide application are discussed below. No apparent differences in community response could be associated with an increased endothall application rate. Moreover, the vertical distribution and community composition were similar in all plots prior to herbicide application.

Reference plots

79. The heterogeneous algal community representing the respective taxonomic classes within each reference plot remained stable throughout the study period. Desmids and attached filamentous green and blue-green algae were dominant. No significant shift in vertical distribution was noted for any identified genera.

Aquathol K: TRT-1, -6, and -5

80. From the Chlorophyceae, the flagellate *Volvox* was initially found near the water surface prior to treatment. Following herbicide application, *Volvox* migrated downward through posttreatment day 3 and was found generally throughout the water column between posttreatment days 7 and 49. The coccoid organisms *Gloeocystis* and *Oocystis* were found throughout the water column within 24 hr posttreatment. By day 7, *Gloeocystis* was present only in the bottom waters in TRT-6 and -5 with *Oocystis* disappearing after posttreatment day 3. By posttreatment day 21, *Gloeocystis* and *Oocystis* had vanished. It was not until posttreatment day 49 that these organisms were found in water samples representing the water near the water-sediment interface of TRT-6 and -5. The filamentous alga *Oedogonium* was initially attached to the hydrilla and, as the hydrilla sank to the bottom following herbicide application, the *Oedogonium* did likewise.

81. In general, the desmids (Conjugatophyceae) increased in abundance as an indirect result of the herbicide treatments. *Desmidium*

became the most dominant alga at all water depths. *Gonatozygon* and *Pleurotaenia* disappeared following herbicide treatment from the water surface to 2 m below the water surface and apparently settled on the sediment associated with the hydrilla. Filamentous surface water algae, *Mougeotia*, *Spirogyra*, and *Zygnema*, were attached to the hydrilla and subsequently settled on the sediment. By posttreatment day 3, these algae had disappeared from the surface water and reappeared in water samples taken at 0.5 above the sediment in greatly reduced numbers indicating significant sensitivity to the herbicide.

82. The diatom (Bacillariophyceae) population was reduced drastically within 24 to 72 hr posttreatment. Prior to treatment they were found throughout the water column; however, between posttreatment days 3 and 49, diatoms *Achnanthes*, *Melosira*, *Navicula*, and *Rhopolodia* could be found only near the water-sediment interface.

83. Within the blue-green algae (Cyanophyceae), several filamentous attached algae bloomed as a mat on the decomposing hydrilla. The most prevalent genera were *Lyngbya*, *Oscillatoria*, and *Tolypothrix*. By posttreatment day 7, these algae had essentially disappeared from the surface along with the hydrilla and began forming an algal mat on the decomposing hydrilla.

Hydout: TRT-3, -7, and -2

84. The immediate changes observed in the phytoplankton of TRT-1, -6, and -5 over the first week posttreatment were not generally apparent in TRT-3, -7, and -2. Instead, subtle changes in community structure were noted between posttreatment days 7 and 49. Significant changes in the Chlorophyceae (green algae) occurred with the flagellate *Volvox*, the coccoid *Pediastrum*, and the filamentous algae *Bulbochaete* and *Coleochaete*. Between posttreatment days 7 and 21, *Volvox* increased abundance throughout the water column. *Pediastrum* bloomed between posttreatment days 3 and 7 and disappeared after posttreatment day 21. *Bulbochaete* was eliminated within 24 hr from TRT-7 and 72 hr from TRT-2 following herbicide application. *Bulbochaete* remained in the surface water samples from TRT-3 throughout the sampling period, except for posttreatment day 7.

85. Within the Conjugatophyceae, the desmid population was affected similar to that described for TRT-1, -6, and -5. In contrast, however, by posttreatment day 49 most of the desmids of TRT-7 and -2 were found in the water samples immediately above the sediment only. Through posttreatment day 21, the desmids were generally found throughout the water column. Moreover, the desmids dominated the water samples after posttreatment day 21 from TRT-3, -7, and -2. The filamentous algae *Spirogyra* and *Zygnema* were apparently controlled by endothall within 72 hr following treatment and recolonization was not noticeable in any plankton samples until day 49 when both were found in plankton samples of TRT-3 from 0.5 m above the water-sediment interface.

86. Only a few *Euglena* (Euglenophyceae) were identified in the 2-m plankton samples from TRT-3 prior to endothall application. These organisms were observed only on posttreatment day 49 in the plankton samples of TRT-3 obtained from 0.5 m above the sediment.

87. No immediate changes occurred in the diatom population (Bacillariophyceae) of TRT-3, -7, and -2 following endothall application. However, *Achnanthes*, *Epithemia*, and *Melosira* apparently migrated from the surface water to the water-sediment interface by posttreatment day 21. This coincided with the settling of hydrilla to the sediment.

88. Most noticeable about the Cyanophyceae was that the filamentous algae, *Lyngbya* and *Oscillatoria*, were quite common between posttreatment days 21 and 49. A blue-green algal mat was established on the decomposing hydrilla during this period based on underwater observations.

Zooplankton

89. Each major taxa of zooplankton representative of 0.3 and 2.0 m below the water surface and 0.5 m above the sediment was enumerated. Nauplii was the dominant copepod throughout the study, followed generally by Cladocera and Rotifera, respectively.

Reference plots

90. A comparison of the total number of organisms per litre for REF-4, and -8 is graphically presented in Figures 31 and 32,

respectively, representing water at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment. Zooplankton abundance in REF-4 exhibited a pulse at the 0.3-m water depth on posttreatment day 7, a slight increase at the 2.0-m water depth on posttreatment day 21, and a large pulse at 0.5 m above the sediment on posttreatment day 49. Likewise, a similar pulse occurred at the 0.3-m water depth on posttreatment day 7 in REF-8. Whereas the total number of organisms per litre increased in REF-4 from posttreatment day 1 (2.5×10^3 organisms per litre) through posttreatment day 49 (6.5×10^3 organisms per litre), there was an immediate decrease in total zooplankton abundance in REF-8 from pretreatment levels (4.2×10^3 organisms per litre) to posttreatment day 1 (2.5×10^3 organisms per litre) and only a slight increase through day 49 (3.3×10^3 organisms per litre).

91. The first pulse in REF-4 at the 0.3-m depth on posttreatment day 7 was probably a natural population oscillation since a similar response was observed in REF-8. The slight increase in zooplankton at the 2.0-m depth on posttreatment day 21 was probably a result of downward migration of zooplankton from the 0.3-m depth. The endothall contamination of REF-4 resulted in some defoliation of hydrilla along the lower stems. Subsequent increase in light penetration, detritus levels, and dissolved organic material in the deeper water permitted increased algal growth and subsequent food supply for zooplankton. This was most apparent in the water samples obtained at 0.5 m above the sediment between posttreatment days 21 and 49.

92. Unlike REF-4, endothall contamination of REF-8 was $\leq$0.01 ppm a.e., i.e. below detection limits. The only zooplankton pulse in REF-8 occurred on posttreatment day 7 (Figure 32). The decline in total zooplankton per litre from pretreatment levels (4.2×10^3 organisms per litre) to approximately 50 percent of that level by posttreatment day 3 was related to the decrease in zooplankton from 2 m below the water surface to 0.5 m above the sediment.

93. The vertical distribution of major taxa and percent composition of the zooplankton community for REF-4 and -8 are presented graphically with the treatment plots for comparison. However, only REF-8

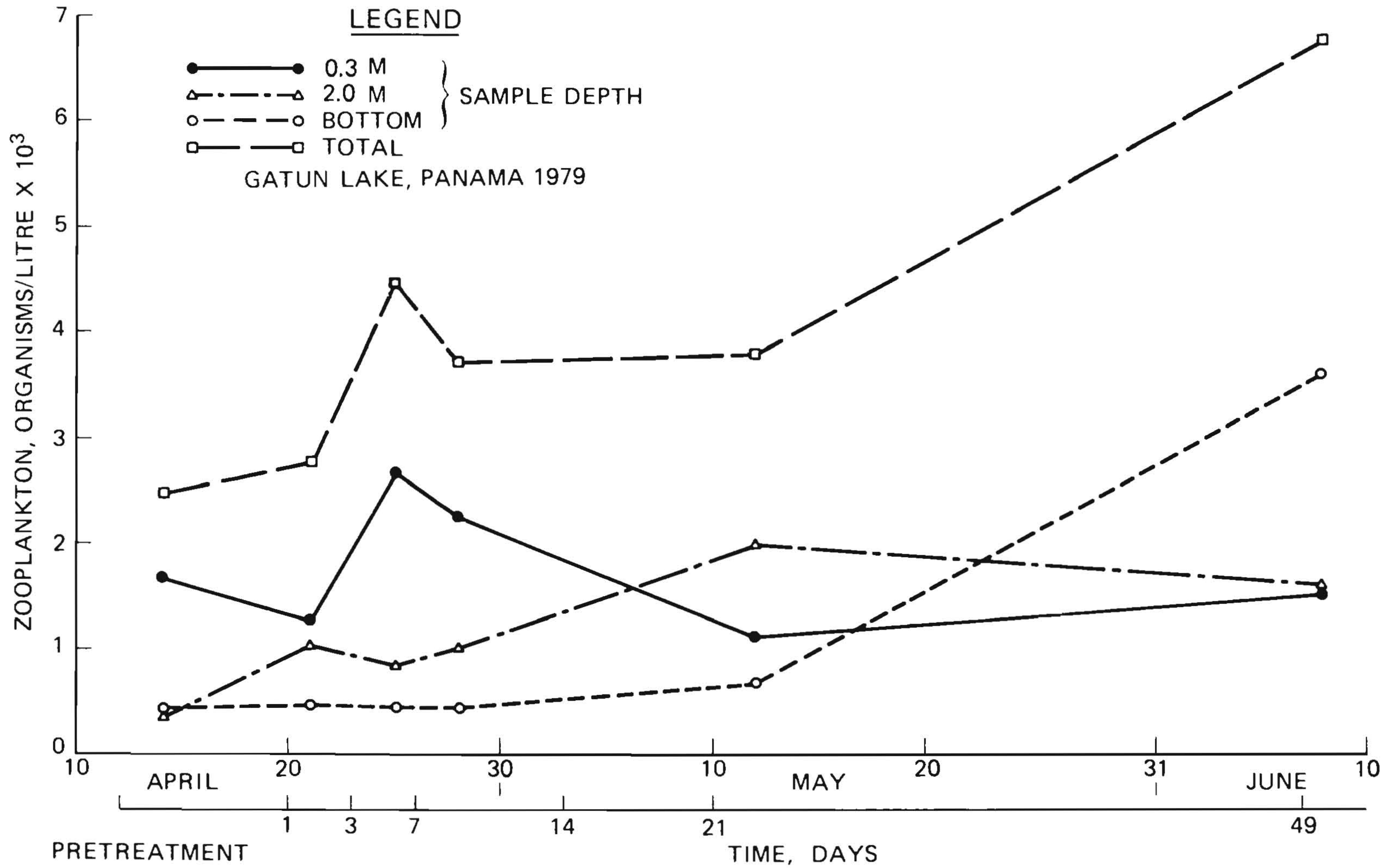

Figure 31. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of REF-4

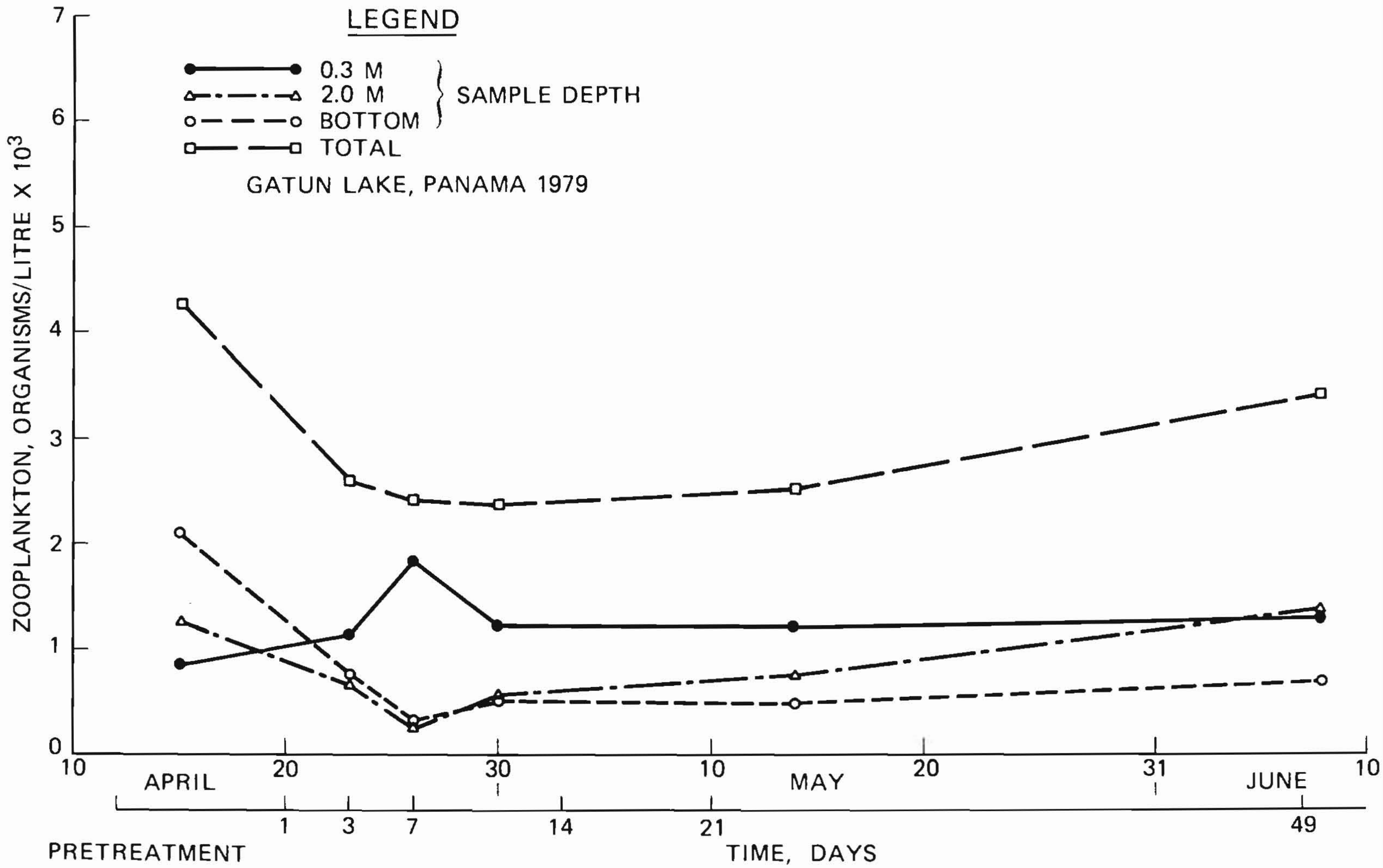

Figure 32. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of REF-8

will be used for comparing herbicide effects on community composition.

Aquathol K: TRT-1, -6, and -5

94. Dipotassium endothall application to TRT-1, -6, and -5 at initial treatment rates of 0.7, 0.6, and 1.1 ppm a.e., respectively, resulted in a decline in the total number of zooplankton per litre throughout the water column by posttreatment day 3 (Figures 33-35). The greatest reduction in total zooplankton occurred in: TRT-1 at 0.3 m below the water surface and 0.5 m above the sediment; TRT-6 at all sampling depths; and TRT-5 at the 0.3-m water depth only. However, by posttreatment day 7, the total number of zooplankton in TRT-1 had nearly recovered to pretreatment levels. Hence, no long-term impacts were observed on the zooplankton population. The increased zooplankton abundance was most prevalent in those water samples obtained at 0.5 m above the sediment.

95. From posttreatment days 7 through 49, zooplankton abundance remained at pretreatment levels in TRT-1. Over this same period, zooplankton abundance at 0.5 m above the sediment gradually declined, whereas a gradual increase was observed at 0.3 and 2.0 m below the water surface. From microscopic observations of population distribution within each sample vial, the sampling method or herbicide treatment may have resulted in an immediate dislodging of epiphytic algae. Downward settling of these epiphytes along with the decline in hydrilla biomass resulted in elimination of this food supply to the zooplankton assemblage in the surface waters. There was a subsequent downward migration of zooplankton.

96. Similar results were observed in TRT-6 and -5. The initial zooplankton decline in TRT-6 through posttreatment day 3 was evident from examination of water samples taken at 0.3 and 2.0 m below the water surface and at 0.5 m above the sediment. From posttreatment day 3 through day 7, the number of organisms throughout the water column of TRT-6 and -5 increased slightly. From posttreatment days 7 through 49, the zooplankton population remained constant below the 2-m water depth as observed in TRT-1. The total zooplankton abundance in TRT-5 showed a marked increase through posttreatment day 21, immediately above the

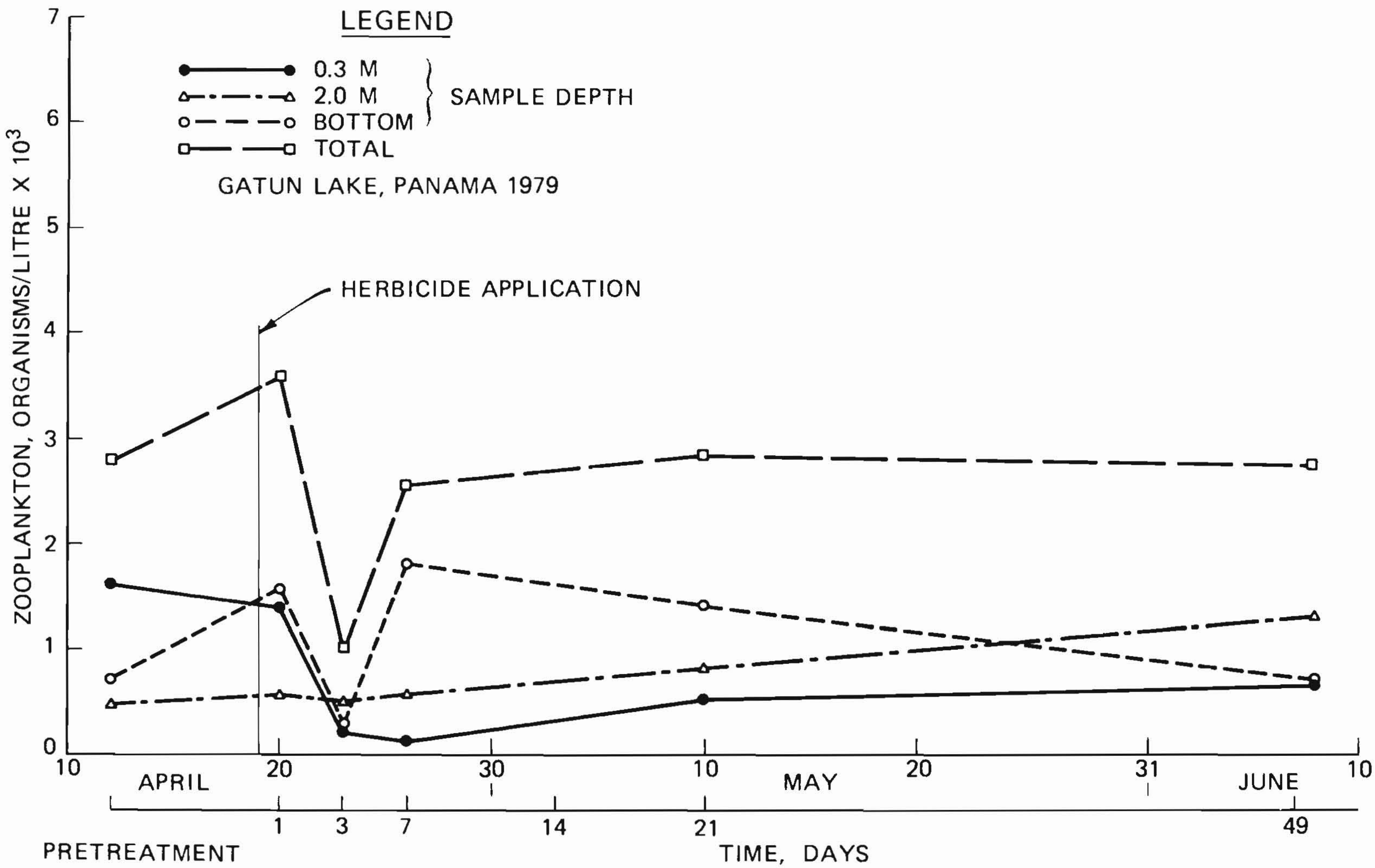

Figure 33. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-1

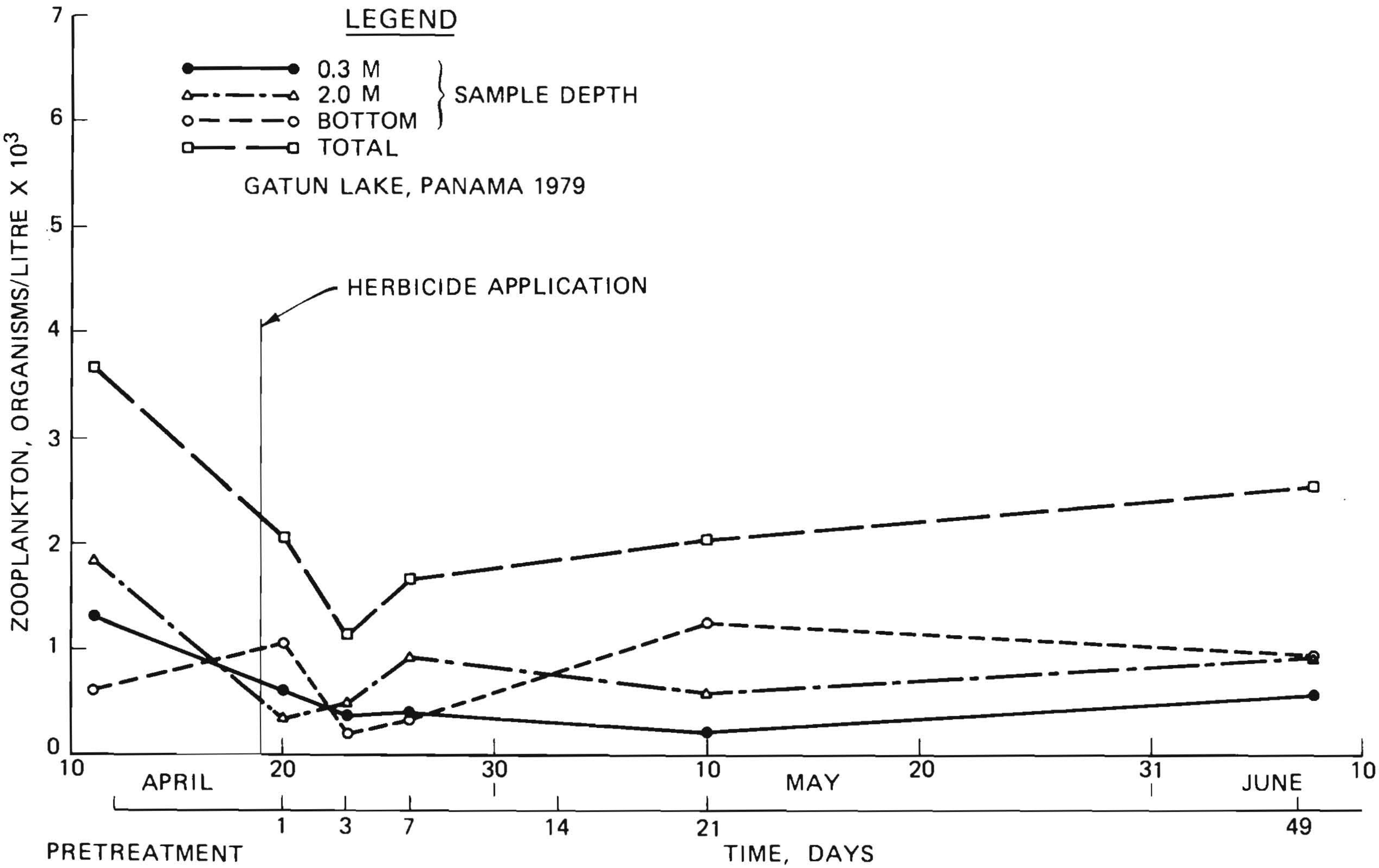

Figure 34. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-6

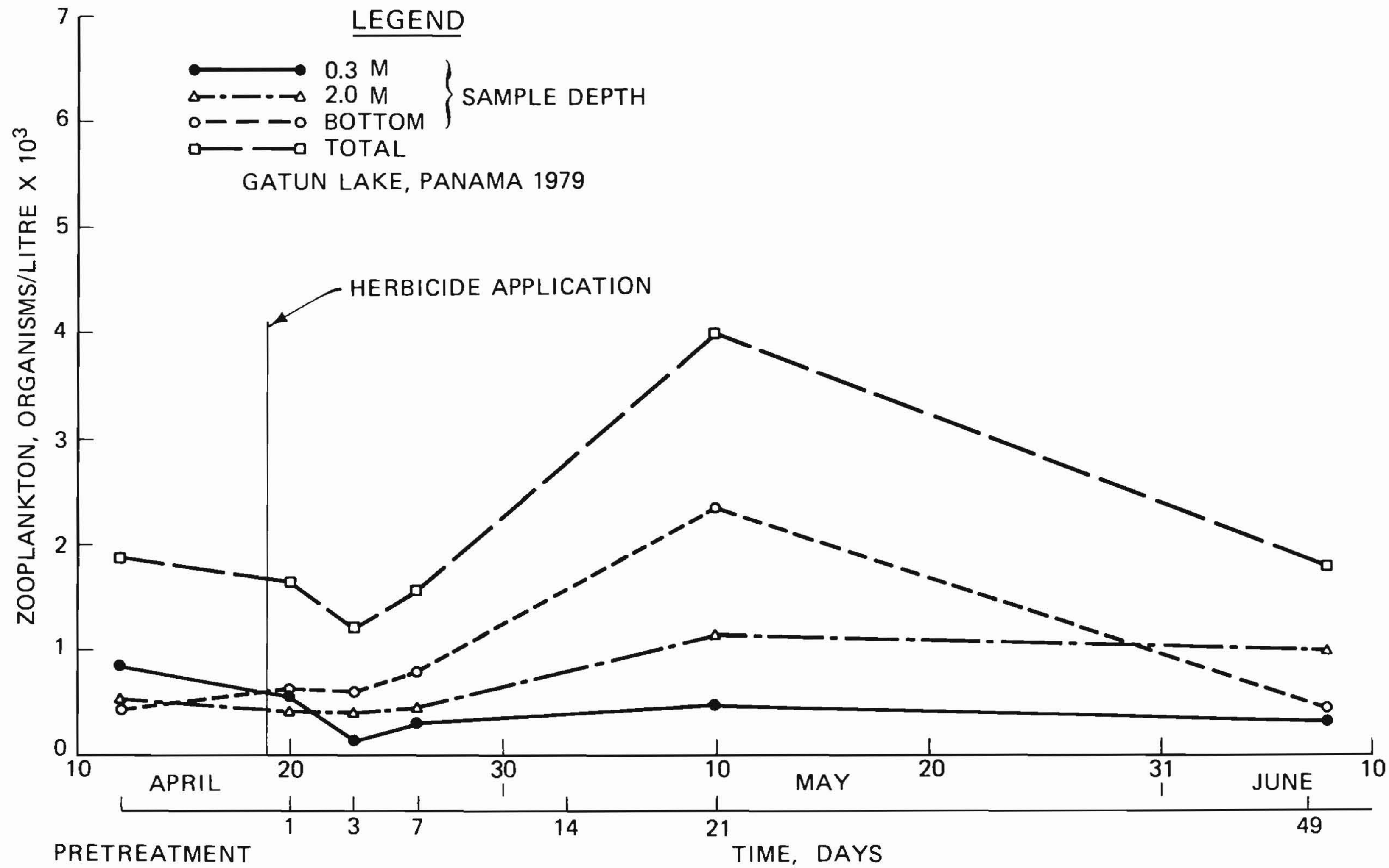

Figure 35. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-5

sediment and decomposing hydrilla biomass. The distribution of the zooplankton population throughout the water column in TRT-5 was otherwise similar to TRT-1 and -6.

97. The percent zooplankton composition in TRT-1, -6, and -5 and REF-4 and -8 is shown in Figure 36. Though zooplankton abundance declined at 0.3 m below the water surface, the percentage composition of various taxa to the zooplankton community remained consistent throughout the posttreatment sampling period. In TRT-1, -6, and -5 at 0.3 m below the water surface, Copepoda dropped to near 0, 10, and 2 percent, respectively, of the total zooplankton population by posttreatment day 3. Similar reduction at the same water depth was observed for Cladocera and Ostracoda; however, only the Ostracoda declined in REF-4 and -8. The Cladocera and Copepoda followed the hydrilla mat downward through the water column. The nauplii component of TRT-1, -6, and -5 increased from 20 percent to greater than 40 percent of the zooplankton community at 0.3 m below the water surface through posttreatment day 49, suggesting that these smaller organisms may have migrated upward to the open water as the hydrilla descended. Moreover, an adequate food source for these organisms, e.g. desmids, remained in the surface water.

98. The zooplankton community composition remained constant at the 2.0-m water depth through posttreatment day 49 in TRT-1, -6, and -5, exclusive of Ostracoda. Moreover, the apparent natural population oscillations of these major taxa were similar to REF-4 and -8. The Copepoda increased from 10 to 40 percent of the total zooplankton in REF-4 by day 49, while the nauplii decreased from 40 percent to approximately 10 percent of the total.

99. Zooplankton abundance at 0.5 m above the sediment of TRT-1, -6, and -5 experienced broad oscillations throughout the study period compared to REF-4 and -8. However, the relative composition of each major taxa remained constant based on their respective percent composition of the community.

<u>Hydout: TRT-3, -7, and -2</u>

100. Application of the dimethylalkylamine endothall formulation to TRT-3, -7, and -2 at estimated initial treatment rates of 0.6, 0.9,

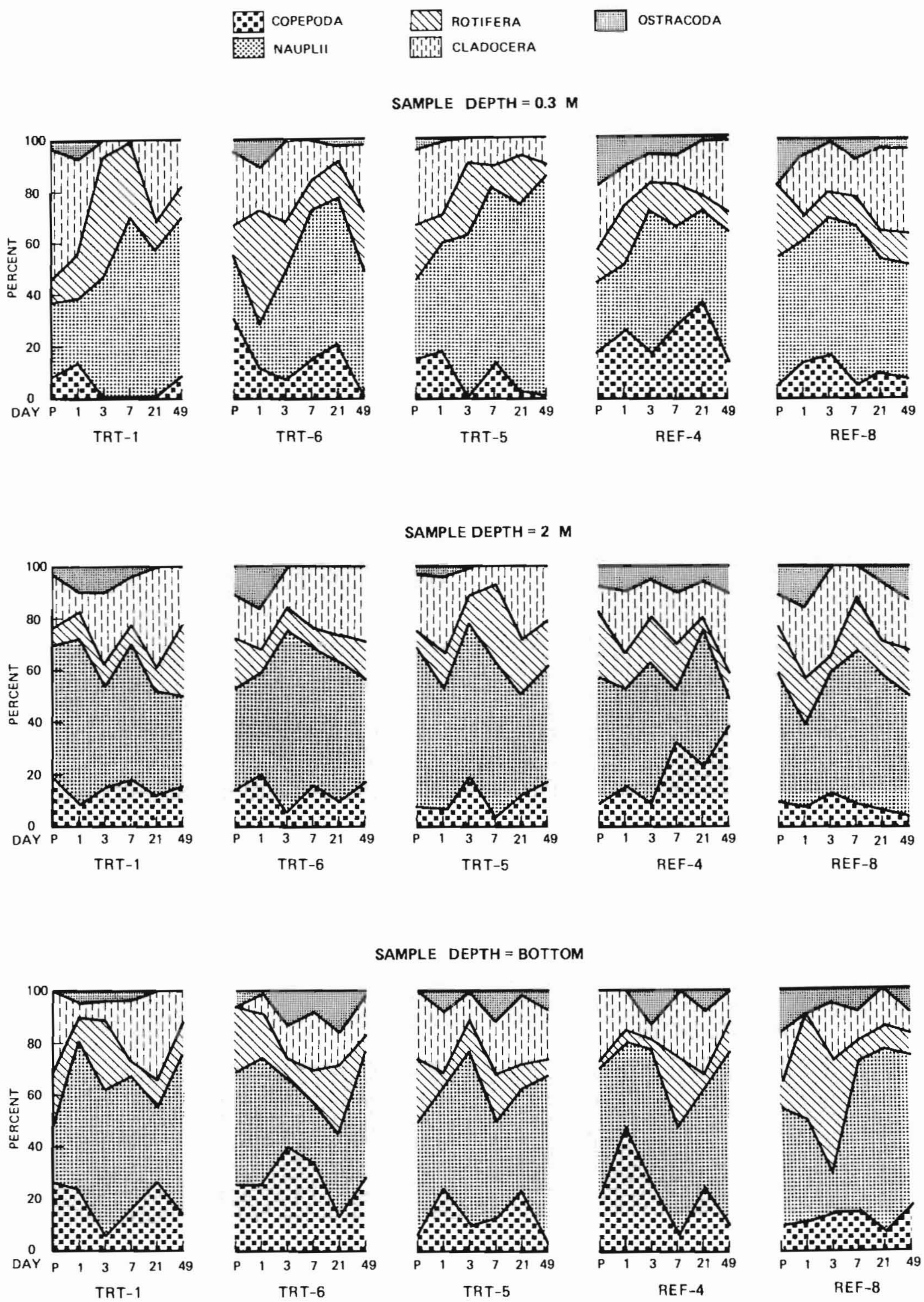

Figure 36. Percent zooplankton composition by taxa in the water column from TRT-1, -6, and -5 and REF-4 and -8

and 1.1 ppm a.e., respectively, had virtually no immediate direct or indirect effects on the zooplankton community (Figures 37-39). The abundance of zooplankton at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment remained constant throughout the study period.

101. Slight changes were observed in the percentage composition of each major taxa (Figure 40). A gradual reduction through posttreatment day 49 in the number of organisms/litre at 0.3 m below the water surface was observed for TRT-3, -7, and -2 when compared to the reference plots. In TRT-3, the nauplii and Cladocera represented a progressively larger proportion of the zooplankton population throughout the study period. However, the percent composition of Ostracoda, Rotifera, and Copepoda in the zooplankton community steadily decreased in TRT-3. At 0.3 m below the water surface in TRT-7 and -2, a similar decrease in abundance occurred as in TRT-3. However, except for posttreatment days 7 and 21, the relative percent composition of the community in TRT-7 remained unchanged. A Cladocera pulse was observed in TRT-7 at 0.3 m below the water surface on posttreatment day 7 and a Rotifera pulse on day 21. Likewise, Copepoda were not found after posttreatment day 21 in TRT-7. No change was observed in zooplankton composition and abundance at 2.0 m below the water surface of TRT-3, -7, and -2. However, a gradual increase in the abundance was evident at 0.5 m above the sediment in TRT-7 and -2 through posttreatment day 49.

102. The slow endothall release from this formulation and its subsequent progressive effects on the hydrilla standing crop (i.e., gradually increased plant decomposition and subsequent downward plant movement) was observed to immediately precede a filamentous algal bloom.

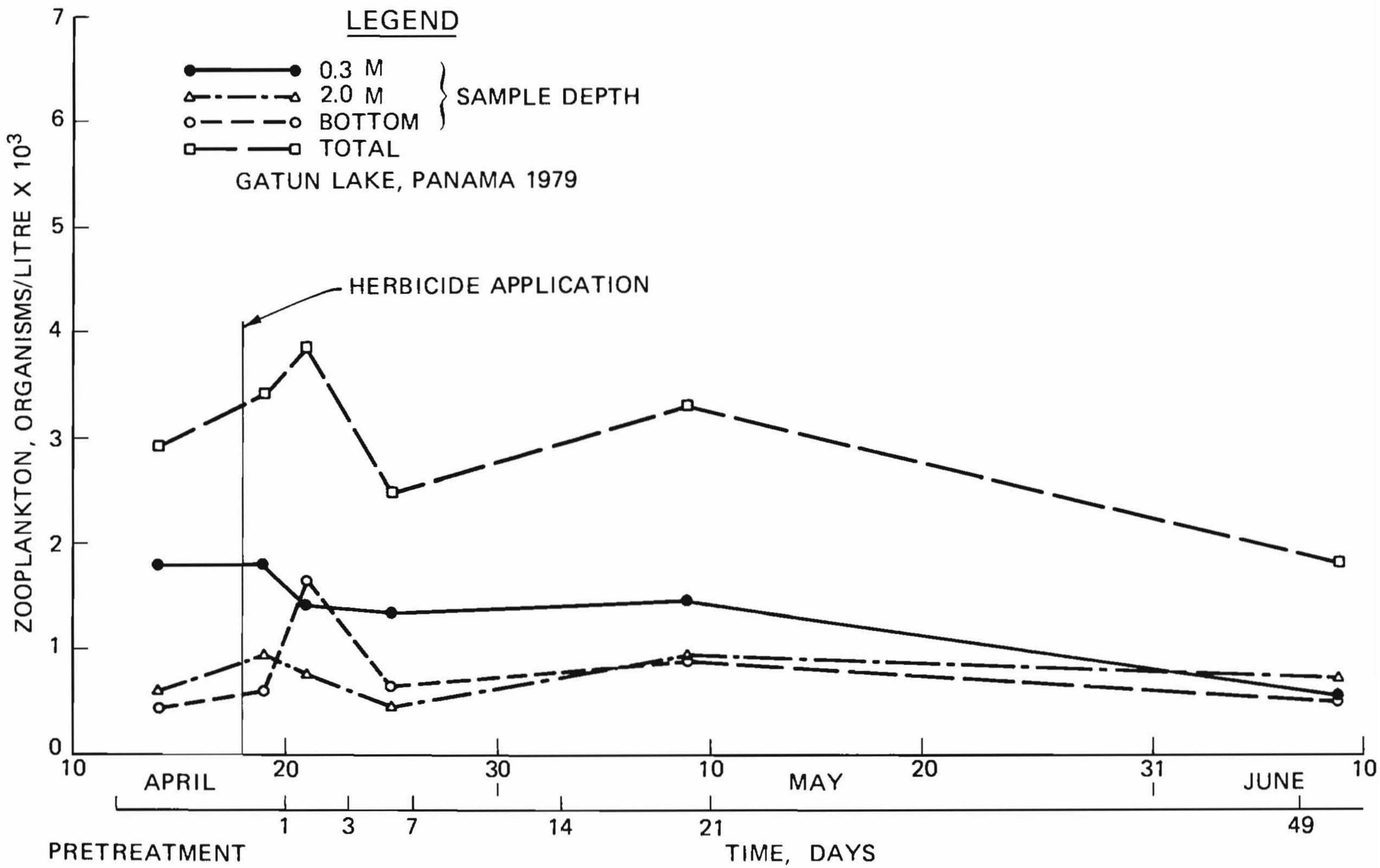

Figure 37. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-3

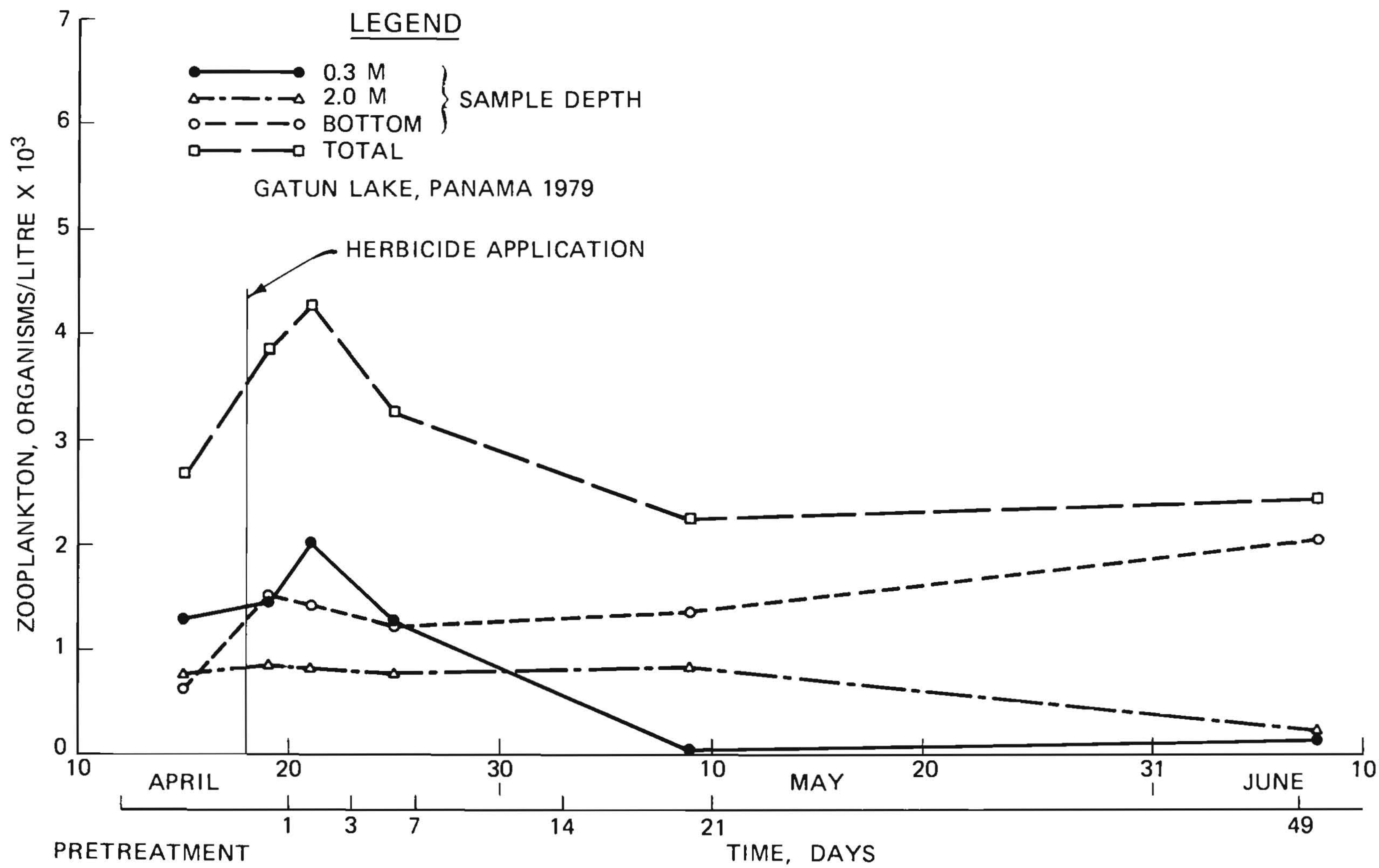

Figure 38. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-7

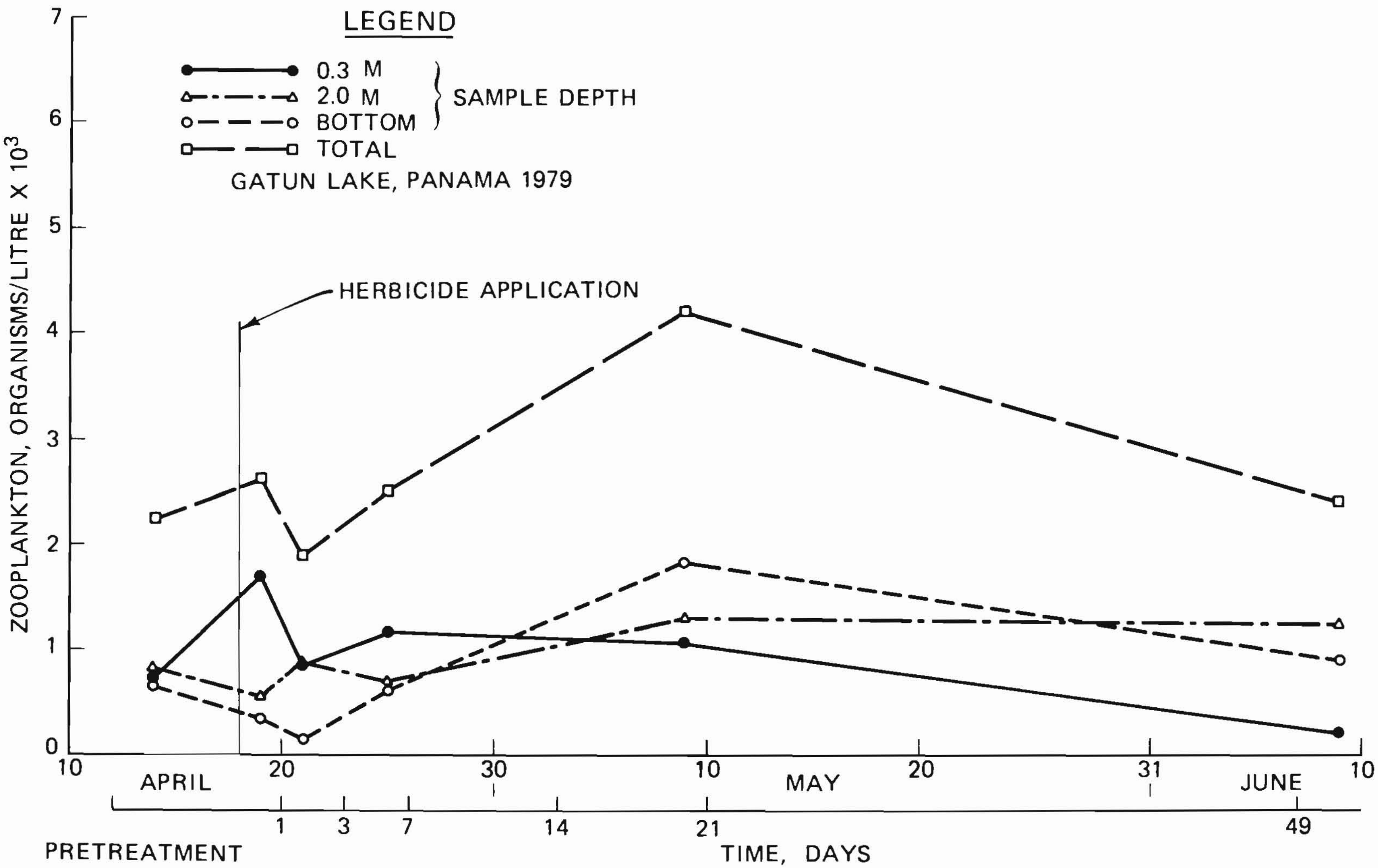

Figure 39. Zooplankton distribution at 0.3 and 2.0 m below the water surface and 0.5 m above the sediment of TRT-2

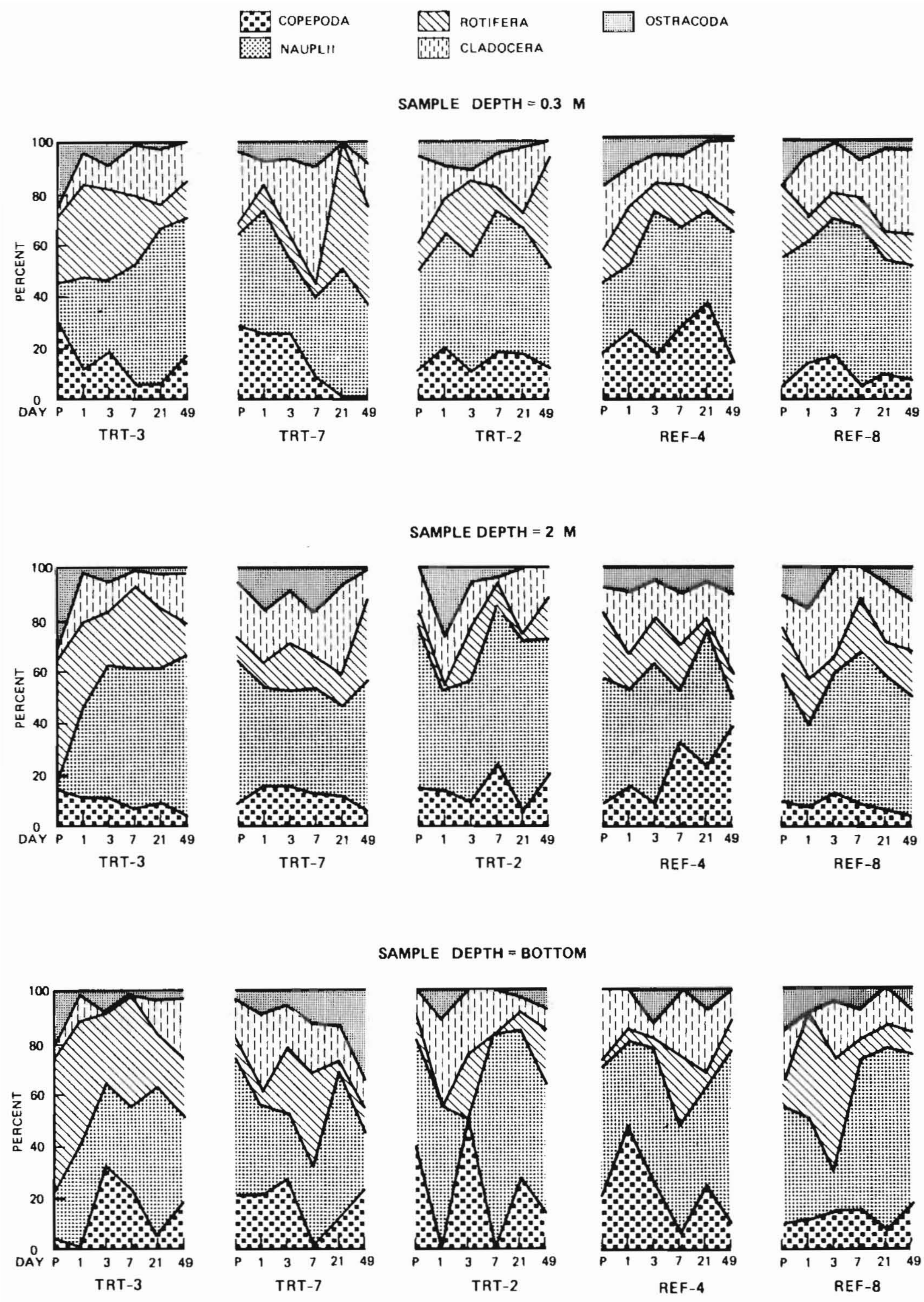

Figure 40. Percent zooplankton composition by taxa in the water column from TRT-3, -7, and -2 and REF-4 and -8

PART IV: DISCUSSION

Endothall Efficacy for Hydrilla Management

103. Results of this study have shown that endothall is effective at low levels (i.e. 0.6 to 1.1 ppm a.e.) in controlling the dense hydrilla standing crop (2.3 to 7.0 kg/m^2) in Frijoles Bay. Armstrong (1974) suggested that, where the growth is young or the weed stand is not heavy, low rates may be used. It is felt that hydrilla biomass is one factor, but not the only one, to be concerned with when determining appropriate endothall application rates. Other factors perhaps more important are water movement, water temperature, hardness, and organic content of sediment. Gatun lake and specifically Frijoles Bay are warm, softwater environments (hardness, 35 to 45 mg/ℓ, and alkalinity, 45 to 55 mg/ℓ) with flocculant, organic sediments and generally very clear water. Yeo (1970) studied the disappearance of the potassium salts of endothall in farm ponds and found that endothall toxicity to plants was more rapid in soft versus hard water and that water temperature did not seem to have a direct effect on endothall toxicity. He also found that the rate of disappearance of endothall from the water column varied directly with the amount of organic matter in the water. Results of this Frijoles Bay study using the dipotassium salt formulation are similar to observations by Yeo (1970) in farm ponds in which water temperature and pH did not directly affect dissipation of endothall. Yeo (1970) also reported that endothall toxicity to plants and fish was more rapid in soft water than in hard water. Rapid control of hydrilla within 3 to 7 days posttreatment and subsequent disappearance of endothall residues through posttreatment day 21 from plant tissue in plots treated with the dipotassium salt formulation suggested rapid adsorption and metabolism of endothall. Similar results have been reported by Keckemet (1980) in which he summarized the rate of disappearance of endothall from water based on over 100 field treatments of whole or partial bodies of water and found that, within 48 to 72 hr following treatment, the endothall concentration in water was less than 0.01 ppm a.e.

104. The granular dimethylalkylamine formulation was also effective against hydrilla in Frijoles Bay, but much slower acting compared to the dipotassium salt formulation. Again, there was rapid removal of the initially low endothall level from the water within 48 to 72 hr; however, endothall residues in hydrilla tissue and sediment did not decrease over the 21-day posttreatment period. The flocculant sediment from each of the treatment plots was comprised mostly of amorphous organic material. The pellets of this formulation were observed embedded in the flocculant organic sediment where they slowly decomposed. Hence, endothall would have been gradually released to the overlying water. Diffusional transport may have dominated the migration of endothall into the overlying water. Endothall persistence exceeding 21 days in sediment and plant tissue was unexpected for this slow-release formulation based on previous experience with endothall field testing in the United States (Sikka and Rice 1973). There are several possible explanations for endothall residue persistence in sediment and hydrilla and the subsequent slow reduction of the hydrilla standing crop over the 3-month posttreatment period. Keckemet (1980) suggested that released endothall would be consumed by the microflora and fauna and degraded at the same time that additional endothall was released, resulting in no accumulation of endothall in the water. Results of this study suggest that any released endothall was rapidly adsorbed to the highly organic, flocculant sediment and absorbed by hydrilla. Moreover, the gradual decline of hydrilla biomass suggests that availability of endothall for absorption by hydrilla tissue was very slow, thereby minimizing uptake and microbial metabolism and decomposition of endothall. Sikka and Rice (1973) reported similar results and suggested several factors: adsorption of endothall to the sediment and, hence, low availability to the soil microfauna, and lesser microbial activity due to lower dissolved oxygen levels in the sediment. Jensen (1964) reported a lag of a few weeks before endothall decomposition began in previously untreated sediment. The lag effect was a result of microfauna populations growing or adapting to metabolize endothall sufficiently to affect its rapid decomposition. Previous investigations, as mentioned, have concentrated

primarily on the microbial metabolic pathway for endothall disappearance from sediment. The microfauna assemblage in sediment from the treatment plots may not have contained an adequate number of organisms capable of degrading endothall. The low to zero DO levels in the sediment may preclude development of microfauna which rapidly metabolize endothall. Anaerobic degradation of refractory organic compounds by heterotrophic organisms is generally considered to be very slow (Westerdahl 1973).

105. Another feasible explanation for prolonged persistence of endothall in lake systems containing highly flocculant, organic sediment is that the endothall pellet sank into the flocculant, organic sediment and the integrity of the pellet remained intact for a prolonged period. Hence, endothall release from the slowly decomposing pellet would be primarily diffusion limited. Following release from the pellet, which was covered by organic sediment, the endothall may have been adsorbed to the organic ligands in the sediment or migrated via diffusion into the overlying water or to the roots whereby absorption into the plant should occur.

106. Both endothall formulations exhibited excellent control of hydrilla in Frijoles Bay of Gatun Lake. The results of this study have shown that the dipotassium salt formulation of endothall was not persistent in the water column or sediment beyond 3 days following treatment. In addition, rapid plant uptake of this liquid formulation resulted in quick herbicidal action enhanced by the warm, soft water of Gatun Lake. Finally, dispersion of this liquid formulation throughout the treated water column did not occur; however, it appeared to disperse as a density flow horizontally and vertically within the treated area and extending into the buffer zones around the treated plots. Herbicidal effects on hydrilla in the buffer areas were not evident. The pelletized dimethylalkylamine formulation persisted longer than the liquid dipotassium endothall in the water, sediment, and hydrilla. Endothall concentrations in the water column decreased to $\leq$0.01 ppm a.e. by posttreatment day 7 and dispersal of endothall into the buffer zone was similar to that of the liquid dipotassium endothall. Endothall residues in sediment and hydrilla tissue from TRT-3, -7, and -2 did not decrease

appreciably through the 21-day study period. Also, endothall concentrations were $\leq$0.01 ppm a.e. by day 7 in the buffer zone water, sediment, and hydrilla.

Endothall Effects on Water Quality

107. No direct effects on water quality were observed resulting from application of either endothall formulation. In fact, increased DO levels were found at greater water depths in those plots treated with the dipotassium salt formulation because the majority of the hydrilla standing crop continued photosynthetic activity as the plant biomass settled out of the water column. Simsimon, Chesters, and Daniel (1972) and Daniel (1972) showed that DO was reduced in laboratory and field model ecosystems. However, Holmberg and Lee (1976) found no endothall effect on water chemistry and DO under natural conditions. The DO profile within the treated areas of Frijoles Bay generally followed the decline of the hydrilla biomass and growth of algal populations, with only a transient DO depletion occurring at 0.5 m above the sediment approximately 14 days posttreatment as a result of the bloom of mat-forming algae on the surface of decomposing hydrilla. A transient 20- to 45-percent reduction of DO saturation that occurred in several of the treatment plots was similar to that found by Barker (1972).

108. Only a very minor, if any, increase in plant nutrients, nitrogen and phosphorus, occurred in the treated areas following herbicide application. Keckemet (1980) and Serns (1975) observed similar results. Daniel (1972) found that endothall did not have a rapid effect on the release of nitrogen and phosphorus to the water. Moreover, released nutrients were rapidly absorbed by phytoplankton and sediment microfauna thereby recycling the nutrients. The bloom of mat-forming algae *Spirogyra* and *Lyngbya* on the surface of the decomposing algae utilized available nutrients before detectable concentrations could be measured in the water. Simsimon, Chesters, and Daniel (1972) observed little change in plant nutrient concentration in water following endothall treatments.

Endothall Effects on Plankton

109. Phytoplankton and zooplankton communities were only temporarily impacted by the herbicide treatments. In summary, the treated plots showed a definite reduction in total genera within the Chlorophyceae (green algae) during the 49-day posttreatment study period. Desmids (Conjugatophyceae) became dominant, probably resulting from stimulation by increased light penetration through the water; whereas, the diatoms (Bacillariophyceae) decreased sharply within 72 hr posttreatment in TRT-1, -6, and -5 (27, 35, and 50 kg a.e./ha, respectively). A very gradual decline in the diatom population occurred throughout the posttreatment study period in TRT-3, -7, and -2 (27, 35, and 50 kg a.e./ha, respectively). Moreover, a dense, filamentous, mat-forming bloom of blue-green algae (Cyanophyceae) consisting primarily of *Lyngbya* and *Oscillatoria* were dominant on the decomposing hydrilla tissue of all treatment plots from posttreatment day 21 through 49. Recently, investigators (Wetzel 1969, Berg 1977) have shown that the secretion of dissolved organic material (DOM) enhances the development of algae. Endothall's mode of action greatly increases the secretion of DOM from the leaves of hydrilla (Berg 1977).

110. *Mougeotia*, *Spirogyra*, and *Zygnema* were very sensitive to the lowest endothall treatment rate. These organisms were not found in any plankton samples following 24 to 72 hr posttreatment through posttreatment day 49. Their number may have been reduced sufficiently so that the likelihood of obtaining these organisms using a 3- to 7-ℓ sampling volume was too small. A much larger water volume is probably required to obtain a water sample containing a few of these organisms. Further toxicity testing is necessary to determine the acute sensitivity of endothall to these phytoplankton. Three studies have reported the effects of endothall on phytoplankton. Holmberg and Lee (1976) monitored phytoplankton populations using chlorophyll-a assays, following one application of 5 ppm dipotassium endothall to a warmwater fish pond. Results of their assays suggested endothall had only a temporary effect, if any, on phytoplankton and the effect was less severe than would be

expected during natural population oscillations. However, Barker (1972) found a 95-percent reduction of phytoplankton following treatment with an endothall formulation. Grigsby (1958) reported that endothall provided complete control of *Chlamydomonas* at a concentration of 10 ppm dipotassium endothall. Results of the study in Frijoles Bay, Gatun Lake, are similar to those reported by Holmberg and Lee (1976).

111. It was not possible to determine if control of phytoplankton genera in this field evaluation was a result of the herbicide or increased predation by zooplankton (e.g. nauplii) and planktivorous fish.

112. Several transient effects on the zooplankton community were observed following treatment with both endothall formulations. First, the abundance, diversity, and percent composition of the zooplankton community remained constant throughout the posttreatment study period, with the possible exception of the ostracods, or seed shrimp. Their reduction may have been a result of habitat change. Similar results were reported by Serns (1975) following a single application of 5 ppm dipotassium endothall and periodic monitoring over a 5-month period. Second, there was a general downward movement of the zooplankton in all treated plots coinciding with the descending hydrilla biomass and associated phytoplankton. This downward migration was required for maintaining contact with their food supply. Finally, by posttreatment day 49, much larger nauplii were present in water samples, suggesting an abundance of food as well as possible reduction in predators, e.g. fish. Removal of the hydrilla standing crop eliminated the protective cover for many fry and fingerling fish and insect larvae. This habitat change may have resulted in their moving to other protective habitats or reduction in numbers resulting from increased predation by larger fish. Hence, the number of nauplii predators may have been reduced permitting the larger nauplii to develop. Fernando (1980) suggested that species and size composition of zooplankton in tropical aquatic environments are affected by combinations of food and temperature. Moreover, he stated that uniform water temperatures did not favor diversity but that high water temperatures favored reduced size. Results of the present study indicate that available food and predator density may have a greater

influence than water temperature on zooplankton size. Moreover, a possible change in the behavior or pigmentation of zooplankton, e.g. nauplii, may have reduced the predator pressure permitting larger sized individuals to develop (Zaret 1972a,b, 1975).

113. No noticeable adverse impacts were observed in the natural fishery resulting from treatment with these endothall formulations. This observation was similar to many previously reported studies (Jackson 1977; Simsimon, Chesters, and Daniel 1976; and Armstrong 1974), conducted both in the laboratory and field, suggesting high endothall tolerance levels by fish.

PART V: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

114. The dipotassium salt and dimethylalkylamine formulations of endothall were considered to be very effective in controlling hydrilla in Frijoles Bay of Gatun Lake, Panama. The following specific conclusions can be drawn:

- a. The liquid dipotassium endothall provided rapid control within 72 hr posttreatment at application rates of 27, 34, and 50 kg a.e./ha, which represent estimated initial endothall concentrations in the water of 0.6 to 1.1 ppm a.e., assuming uniform distribution throughout the water column.
- b. The granular dimethylalkylamine endothall provided control within 14 to 21 days posttreatment at the 34- and 50-kg-a.e./ha application rates, which represent estimated initial endothall concentrations in the water of 0.9 to 1.1 ppm a.e., assuming total solubility and uniform distribution throughout the water column.
- c. The approximate lengths of time required for the hydrilla biomass to recover to pretreatment levels were: 4 months for plots treated with dipotassium endothall, and 6 months for plots treated with the dimethylalkylamine formulation. The dipotassium endothall formulation will require three to four applications per year to maintain control in static-water environments and probably more often in areas experiencing significant water exchange; whereas, only two to three applications per year will be required for the dimethylalkylamine formulation.
- d. The absence of endothall residues in water and sediment approximately 72 hr following treatment with dipotassium endothall makes this formulation most desirable for treating high-use areas, such as swimming, beach, and boat marinas.
- e. No long-term adverse environmental impacts to nontarget organisms, e.g. phytoplankton and zooplankton, were observed in plots treated with the endothall formulations.
- f. The dipotassium endothall can be readily applied using existing PCC equipment. Moreover, it has a long shelf life, i.e. unaffected by inclement weather and high humidity. The skin irritation from dust generated during handling and application of the dimethlylalkylamine

formulation of endothall is compounded by the high air temperatures and humidity typical of Panama.

Recommendations

115. From the results of this field evaluation several recommendations can be made:

- a. Since combinations of these formulations could effectively prolong the hydrilla control period, use of dipotassium endothall is recommended to control the initial hydrilla standing crop followed by a reduced concentration of the dimethylalkylamine formulation approximately 3 to 4 weeks later to control germinating propagules and young plant tissue missed by the previous treatment.
- b. Increasing the concentration of endothall to 1.5 to 2.0 ppm a.e. is recommended. In this manner, more thorough destruction of the existing hydrilla tissue is feasible, thereby prolonging the hydrilla control period.
- c. If only the dipotassium endothall formulation is used, either an adjuvant or polymer should be incorporated to increase dipotassum endothall's persistence and subsequently reduce the quantity of herbicide and resulting costs for each treatment, especially in areas of high water exchange.

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Table 1

Herbicides and Equivalent Application Rates for Field Evaluation

Herbicides		Treatment 1	Treatment 2	Treatment 3
Aquathol K--Aquatic herbicide (liquid)		75	93	140 kg/ha
Current:	Federal Registration with U. S. Environmental Protection Agency (EPA)	27	34	40 kg a.e./ha
Pending:	Amendment allowing increased tolerance limits and immediate use of treated water for domestic purposes, swimming, and irrigation			
Hydout--Aquatic algaecide and herbicide (granular)		269	336	504 kg/ha
Current:	State registration in Alabama, Florida, Georgia, and Texas	27	34	50 kg a.e./ha
Pending:	Application for EPA registration submitted			

Table 2

Average, Maximum, and Minimum Secchi Disk Depths for Mid-April through Mid-May 1979

Plot	Average Secchi Depth,* m	Maximum Secchi Depth, m	Minimum Secchi Depth, m
TRT-1	3.4	5.2 (5/10/79)**	2.4 (4/26/79)
TRT-2	2.9	4.0 (4/14/79)	2.4 (5/02/79)
TRT-3	4.2	5.3 (4/14/79)	3.2 (5/02/79)
REF-4	3.5	4.3 (4/14/79)	2.7 (5/02/79)
TRT-5	3.9	5.2 (4/12/79)	3.2 (5/03/79)
TRT-6	4.2	5.5 (4/11/79)	3.5 (5/03/79)
TRT-7	3.7	4.3 (4/15/79)	2.4 (5/09/79)
REF-8	3.5	4.8 (4/30/79)	2.9 (5/08/79)

* Twelve measurements per plot.
** Date of observation is given in parentheses.

Table 3

List of Significance Levels From the t-Test Comparing Temporal Changes in Hydrilla Biomass of Each Treatment Plot to REF-8

Plots Compared	Pre-treatment	Posttreatment, Days 1	3	21	49	90
REF-8 + TRT-1	0.329	0.234	0.238	0.001*	0.001*	0.002*
REF-8 + TRT-6	0.287	0.568	0.417	0.001*	0.733	0.073*
REF-8 + TRT-5	0.145	0.202	0.098*	0.001*	0.004*	0.000*
REF-8 + TRT-3	0.677	0.153	0.441	0.001*	0.875	0.000*
REF-8 + TRT-7	0.439	0.768	0.517	0.001*	0.058*	0.000*
REF-8 + TRT-2	0.846	0.178	0.405	0.023*	0.111**	0.000*

* Level of significance at $P < 0.10$.
** Nearly significant.

Table 4

Significance Levels for F-Test of Temporal Changes in Mean Endothall Concentrations in Water from TRT-1, -6, and -5 and REF-4 and -8

Plot No.	Treatment	Water Depth 0.3 m	2.0 m	Bottom
REF-8	Reference	0.432	1.000	1.000
	Buffer	--	--	--
REF-4	Reference	0.465	0.326	0.817
	Buffer	--	0.423	--
TRT-1	75 ℓ/ha	0.238	0.092	0.860
	Buffer	--	0.146	0.356
TRT-6	93 ℓ/ha	0.001*	0.454	0.513
	Buffer	--	0.014*	--
TRT-5	140 ℓ/ha	0.033*	0.062	0.034*
	Buffer	--	0.140	--

* Level of significance at $P < 0.05$.

Table 5

Significance Levels for F-Test of Temporal Changes in Mean Endothall Concentrations in Water from TRT-3, -7, -2 and REF -4 and -8

Plot No.	Treatment	Water Depth 0.3 m	2.0 m	Bottom
TRT-3	269 kg/ha	0.069	0.173	0.373
	Buffer	--	0.423	--
TRT-7	336 kg/ha	0.086	0.523	0.729
	Buffer	--	0.423	--
TRT-2	504 kg/ha	0.016*	0.009*	0.049*
	Buffer	--	0.160	0.257
REF-4	Reference	0.465	0.326	0.817
	Buffer	--	0.423	--
REF-8	Reference	0.432	1.000	1.000
	Buffer	--	--	--

* Level of significance at $P < 0.05$.

Table 6

List of Mean Endothall Concentrations (ppm a.e.) in Sediment and Significance Levels for the F-Test

Plot No.	Treatment	Posttreatment, days P*	1	3	7	14	21	P-Value**
REF-8	Reference	--	0.0	0.0	--	--	--	1.0
REF-4	Reference	--	0.0	0.0	--	--	--	1.0
TRT-1	75 ℓ/ha	0.0	0.37	0.28	0.0			0.428
TRT-6	93 ℓ/ha	0.0	0.13	0.0	0.0			0.432
TRT-5	140 ℓ/ha	0.0	0.67	0.13	0.0			0.080
TRT-3	269 kg/ha	0.0	0.83	1.20	1.25	1.17	1.24	0.604
TRT-7	336 kg/ha	0.0	2.87	2.50	2.27	2.89	1.23	0.510
TRT-2	504 kg/ha	0.0	1.32	0.87	1.46	0.78	2.80	0.609

* Pretreatment.
** Level of significant at $P < 0.05$.

Table 7

List of Mean Endothall Concentrations (ppm a.e.) in Hydrilla and Significance Levels for the F-Test

Plot No.	Treatment	Posttreatment, days P*	1	3	7	14	21	P-Value
REF-8	Reference	0.0	0.0	0.0	0.0	0.0	0.0	1.0
REF-4	Reference	0.0	0.065	0.065	0.050	0.040	0.0	0.909
TRT-1	75 ℓ/ha	0.0	0.378	0.592	0.327	0.327	0.180	0.005**
TRT-6	93 ℓ/ha	0.0	0.295	0.195	0.210	0.160	0.040	0.001**
TRT-5	140 ℓ/ha	0.0	0.410	0.362	0.267	0.147	0.112	0.006**
TRT-3	269 kg/ha	0.0	0.090	0.260	0.155	0.362	0.135	0.282
TRT-7	336 kg/ha	0.0	0.320	0.205	0.492	0.340	0.222	0.712
TRT-2	504 kg/ha	0.0	0.105	0.160	0.420	0.220	0.260	0.366

* Pretreatment.
** Level of significance at $P < 0.05$.

Table 8

Maximum, Minimum, and Mean Concentrations Observed for Selected Water Quality Parameters from TRT-1 Through -8 and Respective Buffer Area

Water Depth	Water Temp. °C	Conductivity µmhos/cm	DO ppm	pH	Turbidity JTU*	BOD_5 ppm	NH_3-N ppm	TKN ppm	T-PO_4 ppm	Hardness ppm	Alkalinity ppm	Color
					TRT-1							
0.3 m												
Max.	31.0	141.0	9.7	9.2	1.20	1.15	0.08	0.11	0.03	43.0	54.0	20
Min.	29.0	126.0	4.3	6.9	0.33	0.20	0.01	0.10	0.01	37.0	42.0	10
Mean	30.1	129.2	6.2	7.8	0.58	0.21	0.04	0.10	0.02	40.0	48.6	14
1.0 m												
Max.	31.0	139.0	7.5	8.3	.	.	.	.	.	.	.	.
Min.	29.0	125.0	3.9	6.9	.	.	.	.	.	.	.	.
Mean	29.8	129.5	5.5	7.6	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.0	138.0	7.1	8.2	1.10	1.07	0.06	0.12	0.10	44.0	53.0	15
Min.	29.0	126.0	2.8	6.1	0.30	0.05	0.01	0.10	0.01	39.0	39.0	10
Mean	29.5	129.5	4.5	7.4	0.54	0.69	0.04	0.10	0.02	41.3	47.0	11
Bottom**												
Max.	30.0	141.0	7.6	7.7	3.40	5.47	0.12	0.15	0.04	44.0	52.0	70
Min.	28.0	123.0	0.2	7.1	0.33	0.25	0.07	0.10	0.01	38.0	40.0	10
Mean	29.2	135.7	2.0	6.9	2.70	2.41	0.06	0.12	0.03	42.0	47.6	31
					BUFFER 1							
0.3 m												
Max.	31.4	130.0	9.3	9.1	2.2	0.98	0.07	0.13	0.09	44.0	53.0	15
Min.	29.2	124.0	4.7	6.9	0.4	0.10	0.01	0.10	0.01	38.0	38.0	5
Mean	30.6	126.6	6.4	7.8	0.7	0.84	0.03	0.10	0.01	41.0	48.0	13
1.0 m												
Max.	31.0	131.0	6.9	8.6	.	.	.	.	.	.	.	.
Min.	29.0	125.0	4.2	6.9	.	.	.	.	.	.	.	.
Mean	30.2	127.8	6.0	7.6	.	.	.	.	.	.	.	.
2.0 m												
Max.	31.0	131.0	6.7	8.1	9.1	1.17	0.05	0.10	0.19	41.0	53.0	20
Min.	29.0	125.0	3.4	6.8	0.3	0.25	0.01	0.01	0.01	38.0	38.0	10
Mean	29.8	128.0	5.0	7.4	0.8	0.66	0.66	0.03	0.02	41.7	48.0	11
Bottom**												
Max.	31.0	141.0	1.3	7.5	8.1	3.97	0.12	0.32	0.04	43.0	53.0	70
Min.	29.0	123.0	0.1	6.6	0.4	0.05	0.04	0.01	0.01	39.0	38.0	10
Mean	29.2	130.6	0.9	6.8	4.7	2.38	0.10	0.15	0.02	42.3	47.67	38
					TRT-2							
0.3 m												
Max.	31.6	131.0	8.5	8.7	1.20	1.65	0.30	0.29	0.02	53.0	53.0	15
Min.	29.7	123.0	5.2	7.2	0.36	0.35	0.01	0.10	0.10	43.0	41.0	5
Mean	30.7	126.5	6.7	7.9	0.64	0.84	0.02	0.12	0.01	43.3	47.0	12
1.0 m												
Max.	30.8	130.0	8.4	8.3	.	.	.	.	.	.	.	.
Min.	29.1	123.0	4.3	7.0	.	.	.	.	.	.	.	.
Mean	30.0	127.2	6.1	7.7	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.6	131.0	8.3	8.1	1.60	1.42	0.36	0.34	0.15	47.0	52.0	15
Min.	28.7	124.0	3.9	7.0	0.33	0.67	0.10	0.10	0.02	42.0	44.0	10
Mean	30.0	127.5	5.3	7.4	0.74	0.80	0.02	0.12	0.20	42.7	49.0	11
Bottom**												
Max.	30.5	148.0	2.4	7.2	5.40	5.27	0.15	0.15	0.04	47.0	52.0	55
Min.	28.5	116.0	0.1	6.5	0.42	0.32	0.02	0.10	0.01	39.0	47.0	35
Mean	21.0	131.7	1.2	6.9	2.63	1.97	0.04	0.11	0.02	43.0	50.0	27
					BUFFER 2							
0.3 m												
Max.	32.3	130.0	10.6	8.6	1.40	1.40	0.09	0.12	0.03	46.0	51.0	15
Min.	29.8	108.0	4.6	6.8	0.39	0.17	0.01	0.10	0.01	39.0	39.0	10
Mean	31.0	124.0	7.2	8.1	0.65	0.80	0.04	0.10	0.01	42.0	45.3	10
1.0 m												
Max.	31.5	130.0	9.1	8.6	.	.	.	.	.	.	.	.
Min.	29.0	110.0	5.8	7.5	.	.	.	.	.	.	.	.
Mean	30.5	126.0	6.6	7.8	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.9	130.0	6.5	7.8	1.70	1.50	0.10	0.29	0.02	43.0	50.0	50
Min.	30.2	126.0	4.5	7.0	0.48	0.30	0.01	0.04	0.01	41.0	39.0	10
Mean	30.0	128.0	5.2	7.4	0.73	0.80	0.03	0.13	0.01	42.7	46.7	14
Bottom**												
Max.	30.5	159.0	2.4	7.2	15.00	5.80	0.46	0.44	0.03	45.0	47.0	70
Min.	28.4	125.0	0.1	6.5	0.47	1.10	0.01	0.10	0.01	43.0	39.0	15
Mean	29.25	134.0	1.6	6.8	3.35	1.80	0.09	0.17	0.02	47.0	48.7	30

(Continued)

* JTU = Jackson turbidity units.
** 0.5 m above sediment.

Table 8 (Continued)

Water Depth	Water Temp. °C	Conductivity µmhos/cm	DO ppm	pH	Turbidity JTU	BOD_5 ppm	NH_3-N ppm	TKN ppm	T-PO_4 ppm	Hardness ppm	Alkalinity ppm	Color
					TRT-3							
0.3 m												
Max.	30.8	148.0	7.6	8.0	1.80	1.60	0.14	0.15	0.07	45.0	53.0	15
Min.	29.1	126.0	5.6	7.3	0.34	0.50	0.01	0.10	0.01	40.0	40.0	10
Mean	29.9	130.0	6.5	7.8	0.71	1.01	0.04	0.10	0.01	42.5	47.0	12
1.0 m												
Max.	30.6	144.0	6.3	7.8	.	.	.	.	.	.	.	.
Min.	29.0	123.0	5.0	7.3	.	.	.	.	.	.	.	.
Mean	30.0	130.0	5.7	7.5	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.5	147.0	6.4	7.5	1.20	1.32	0.09	0.13	0.03	44.0	52.0	20
Min.	29.0	128.0	3.1	7.2	0.36	0.47	0.01	0.05	0.01	42.0	38.0	10
Mean	30.0	131.0	4.8	7.4	0.78	0.84	0.05	0.11	0.02	42.0	47.0	13
Bottom**												
Max.	31.4	135.0	6.6	7.9	3.80	2.70	0.10	0.10	0.03	49.0	52.0	35
Min.	28.9	116.0	0.9	6.8	0.46	0.85	0.04	0.10	0.01	44.0	48.0	20
Mean	29.4	133.0	2.1	7.0	2.09	1.52	0.08	0.11	0.03	43.5	49.0	28
					BUFFER 3							
0.3 m												
Max.	32.3	132.0	8.8	8.6	0.71	1.25	0.06	0.16	0.04	45.0	51.0	15
Min.	29.4	110.0	5.4	7.4	0.35	0.10	0.01	0.10	0.01	43.0	38.0	5
Mean	30.5	127.0	6.4	7.8	0.53	0.76	0.03	0.11	0.01	44.0	45.0	8
1.0 m												
Max.	30.7	132.0	6.8	7.9	.	.	.	.	.	.	.	.
Min.	29.1	124.0	5.0	7.3	.	.	.	.	.	.	.	.
Mean	30.0	129.0	5.7	7.5	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.6	133.0	6.7	8.0	0.72	1.25	0.08	0.14	0.03	44.0	52.0	15
Min.	28.9	125.0	4.1	7.1	0.34	0.22	0.01	0.10	0.01	43.0	41.0	5
Mean	29.8	129.0	5.2	7.4	0.50	0.73	0.03	0.10	0.01	44.0	47.0	12
Bottom**												
Max.	30.4	154.0	5.5	7.7	36.00	1.65	0.17	0.22	0.06	54.0	63.0	70
Min.	28.4	124.0	0.1	6.7	0.57	0.60	0.02	0.10	0.02	44.0	42.0	10
Mean	29.2	134.0	1.0	6.81	7.06	1.37	0.11	0.16	0.02	48.5	47.5	43
					TRT-4							
0.3 m												
Max.	31.6	130.0	8.8	8.9	3.40	1.52	0.08	0.15	0.06	46.0	56.0	20
Min.	29.4	122.0	4.6	7.0	0.46	0.20	0.01	0.10	0.01	40.0	46.0	10
Mean	30.6	128.0	6.4	7.9	1.22	0.68	0.04	0.10	0.02	42.3	51.7	12
1.0 m												
Max.	30.9	130.0	7.6	8.1	.	.	.	.	.	.	.	.
Min.	29.1	126.0	4.1	7.1	.	.	.	.	.	.	.	.
Mean	30.0	129.0	5.4	7.5	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.6	130.0	7.0	7.8	1.70	1.10	0.10	0.15	0.02	44.0	54.0	15
Min.	28.9	122.0	4.0	7.0	0.38	0.20	0.01	0.10	0.01	42.0	50.0	10
Mean	29.6	129.0	4.7	7.3	1.02	0.54	0.04	0.10	0.01	43.0	52.0	13
Bottom**												
Max.	30.4	135.0	9.3	7.4	60.00	1.20	0.15	0.27	0.06	43.0	54.0	70
Min.	26.3	123.0	0.8	6.5	1.40	0.55	0.02	0.10	0.01	36.0	31.0	10
Mean	29.0	128.0	2.2	6.9	10.45	0.79	0.06	0.12	0.03	40.7	47.3	32
					BUFFER 4							
0.3 m												
Max.	31.0	134.0	7.8	8.4	2.10	0.65	0.53	0.30	0.02	46.0	52.0	20
Min.	29.1	125.0	4.1	7.1	0.38	0.17	0.01	0.10	0.01	40.0	51.0	5
Mean	30.2	129.0	5.8	7.6	0.72	0.44	0.08	0.15	0.01	43.0	52.0	12
1.0 m												
Max.	30.9	133.0	7.4	8.2	.	.	.	.	.	.	.	.
Min.	29.1	128.0	3.8	7.1	.	.	.	.	.	.	.	.
Mean	30.0	130.0	5.3	7.5	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.6	132.0	7.0	8.2	4.10	4.35	0.67	0.32	0.15	44.0	56.0	30
Min.	28.9	128.0	3.8	7.1	0.43	0.20	0.01	0.10	0.01	40.0	48.0	5
Mean	29.6	130.0	4.8	7.4	1.14	0.87	0.08	0.14	0.04	42.7	53.0	15
Bottom**												
Max.	30.2	158.0	3.8	7.5	57.00	1.37	0.25	0.32	0.05	54.0	65.0	70
Min.	27.5	114.0	0.2	6.5	3.20	0.85	0.04	0.10	0.01	38.0	29.0	20
Mean	28.0	138.0	1.1	6.8	14.47	1.10	0.12	0.20	0.03	43.7	49.7	54

(Continued)

** 0.5 m above sediment.

Table 8 (Continued)

Water Depth	Water Temp. °C	Conductivity µmhos/cm	DO ppm	pH	Turbidity JTU	BOD_5 ppm	NH_3-N ppm	TKN ppm	T-PO_4 ppm	Hardness ppm	Alkalinity ppm	Color
					TRT-5							
0.3 m												
Max.	31.7	134.0	8.9	9.0	1.40	4.20	0.12	0.12	0.06	43.0	55.0	15
Min.	30.6	123.0	5.8	7.4	0.26	0.05	0.01	0.10	0.01	41.0	38.0	10
Mean	31.0	128.0	7.1	8.2	0.50	1.56	0.05	0.10	0.02	42.0	46.0	11
1.0 m												
Max.	31.4	133.0	7.4	8.2	.	.	.	.	.	.	.	.
Min.	29.3	129.0	5.1	7.3	.	.	.	.	.	.	.	.
Mean	30.3	128.0	6.5	7.9	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.9	133.0	7.7	8.2	0.61	4.15	0.10	0.13	0.03	45.0	53.0	15
Min.	29.0	127.0	3.2	7.2	0.28	0.10	0.01	0.10	0.01	40.0	38.0	10
Mean	30.1	129.0	5.6	7.5	1.55	1.51	0.10	0.10	0.01	42.0	47.3	11
Bottom**												
Max.	30.6	151.0	4.2	7.5	8.20	7.10	0.24	0.25	0.06	48.0	57.0	55
Min.	28.5	128.0	0.1	6.4	1.30	0.10	0.04	0.10	0.01	40.0	41.0	10
Mean	29.5	133.0	1.3	6.9	4.01	3.37	0.12	0.15	0.03	43.8	49.6	32
					BUFFER 5							
0.3 m												
Max.	31.7	130.0	7.6	8.3	0.72	4.10	0.10	0.10	0.07	45.0	54.0	15
Min.	29.5	119.0	5.8	7.4	0.28	0.05	0.01	0.10	0.01	38.0	41.0	5
Mean	31.0	127.0	6.6	8.0	0.45	0.84	0.04	0.10	0.02	41.7	48.7	11
1.0 m												
Max.	31.5	129.0	7.2	8.3	.	.	.	.	.	.	.	.
Min.	29.3	126.0	4.7	7.2	.	.	.	.	.	.	.	.
Mean	30.4	128.0	6.3	7.9	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.9	130.0	6.8	8.1	0.57	4.35	0.14	0.14	0.02	44.0	52.0	30
Min.	29.0	126.0	4.8	7.3	0.30	0.10	0.01	0.10	0.01	40.0	41.0	10
Mean	30.0	128.0	5.8	7.6	4.06	1.27	0.05	0.11	0.01	42.0	48.3	12
Bottom**												
Max.	29.8	155.0	2.4	7.3	15.00	2.07	0.18	0.22	0.08	50.0	63.0	55
Min.	28.2	128.0	0.1	6.5	0.41	0.05	0.05	0.10	0.01	43.0	41.0	10
Mean	28.4	141.0	0.7	6.8	5.33	1.53	0.11	0.15	0.02	45.7	52.0	38
					TRT-6							
0.3 m												
Max.	31.5	140.0	11.2	9.2	2.80	4.17	0.08	0.14	0.02	43.0	53.0	26
Min.	29.4	124.0	5.6	7.3	0.28	0.15	0.01	0.10	0.01	40.0	45.0	10
Mean	30.6	128.8	7.2	8.2	0.71	1.50	0.03	0.10	0.01	42.0	49.0	12
1.0 m												
Max.	31.2	139.0	7.5	8.4	.	.	.	.	.	.	.	.
Min.	29.6	126.0	4.6	7.2	.	.	.	.	.	.	.	.
Mean	30.4	129.2	6.5	8.0	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.8	138.0	7.8	8.2	1.20	4.10	0.08	0.15	0.02	44.0	53.0	15
Min.	28.7	123.0	4.3	7.2	0.29	0.10	0.02	0.10	0.01	40.0	41.0	10
Mean	30.0	128.7	5.8	7.7	0.57	1.52	0.04	0.11	0.01	42.3	48.3	12
Bottom**												
Max.	30.7	142.0	5.5	7.5	8.20	5.80	0.08	0.16	0.03	45.0	53.0	40
Min.	28.6	125.0	0.2	6.6	0.32	0.15	0.02	0.10	0.01	40.0	44.0	10
Mean	29.5	133.2	1.9	7.0	2.91	2.14	0.05	0.11	0.01	43.7	51.0	22
					BUFFER 6							
0.3 m												
Max.	31.7	131.0	8.1	8.8	0.76	4.58	0.07	0.10	0.02	45.0	55.0	15
Min.	29.7	119.0	5.7	7.5	0.24	0.05	0.01	0.10	0.01	41.0	41.0	10
Mean	30.0	127.0	6.9	8.1	0.49	1.60	0.03	0.10	0.01	42.3	49.0	10
1.0 m												
Max.	31.6	131.0	7.5	8.5	.	.	.	.	.	.	.	.
Min.	29.2	125.0	4.3	7.3	.	.	.	.	.	.	.	.
Mean	30.0	127.2	6.3	7.7	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.8	131.0	6.8	8.2	1.20	5.20	0.07	0.10	0.04	45.0	52.0	15
Min.	28.8	125.0	4.1	7.2	0.24	0.20	0.01	0.10	0.01	40.0	43.0	10
Mean	29.8	127.4	5.8	7.7	0.56	1.49	0.03	0.10	0.01	42.3	49.3	16
Bottom**												
Max.	30.3	155.0	2.2	6.9	5.10	6.27	0.17	0.70	0.05	51.0	62.0	50
Min.	28.2	128.0	0.1	6.5	0.95	0.05	0.02	0.10	0.01	43.0	44.0	10
Mean	29.0	140.8	0.8	6.8	3.31	2.15	0.08	0.13	0.02	46.0	51.7	27

(Continued)

** 0.5 m above sediment.

Table 8 (Concluded)

Water Depth	Water Temp. °C	Conductivity µmhos/cm	DO ppm	pH	Turbidity JTU	BOD_5 ppm	NH_3-N ppm	TKN ppm	T-PO_4 ppm	Hardness ppm	Alkalinity ppm	Color
					TRT-7							
0.3 m												
Max.	32.3	127.0	10.9	9.0	1.10	1.72	0.07	0.12	0.06	42.0	52.0	15
Min.	29.4	113.0	7.0	8.3	0.38	0.30	0.01	0.10	0.01	38.0	42.0	10
Mean	31.0	124.2	8.8	8.6	0.60	0.80	0.03	0.10	0.02	40.0	46.3	10
1.0 m												
Max.	31.4	130.0	9.2	8.8	.	.	.	.	.	.	.	.
Min.	29.3	125.0	6.7	8.0	.	.	.	.	.	.	.	.
Mean	30.7	126.2	8.0	8.4	.	.	.	.	.	.	.	.
2.0 m												
Max.	31.0	130.0	8.6	8.7	5.50	1.67	0.12	0.18	0.07	43.0	54.0	30
Min.	29.3	120.0	4.1	7.6	0.40	0.25	0.01	0.10	0.01	41.0	43.0	10
Mean	32.7	125.75	7.4	8.2	1.19	0.84	0.05	0.11	0.02	42.3	51.3	22
Bottom**												
Max.	30.6	217.0	4.2	8.0	6.20	2.86	0.18	0.18	0.11	48.0	60.0	40
Min.	29.2	129.0	0.1	6.3	0.82	0.32	0.03	0.10	0.01	39.0	49.0	10
Mean	30.0	156.8	1.8	6.7	2.36	1.25	0.08	0.12	0.03	43.3	51.3	22
					BUFFER 7							
0.3 m												
Max.	32.5	130.0	10.6	9.0	8.80	1.82	0.05	0.12	0.01	43.0	53.0	15
Min.	29.6	126.0	8.8	8.7	0.29	0.05	0.01	0.10	0.01	38.0	40.0	5
Mean	31.5	125.8	9.4	8.7	1.29	0.80	0.03	0.10	0.01	39.3	46.0	11
1.0 m												
Max.	31.8	132.0	10.6	9.0	.	.	.	.	.	.	.	.
Min.	29.5	124.0	7.3	8.1	.	.	.	.	.	.	.	.
Mean	31.0	127.5	9.0	8.6	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.9	132.0	9.8	9.0	1.20	1.65	0.04	0.10	0.02	42.0	55.0	20
Min.	29.4	124.0	5.3	7.3	0.38	0.40	0.01	0.10	0.01	40.0	41.0	10
Mean	30.2	127.5	7.4	8.2	0.55	0.87	0.03	0.10	0.01	41.3	49.3	10
Bottom**												
Max.	30.7	152.0	6.0	8.2	7.80	3.07	0.13	0.18	0.06	45.0	55.0	70
Min.	29.3	126.0	0.2	6.5	0.23	0.25	0.02	0.10	0.01	39.0	47.0	15
Mean	29.7	136.2	1.9	7.1	1.72	1.47	0.06	0.11	0.02	42.7	51.3	25
					TRT-8							
0.3 m												
Max.	31.7	141.0	11.5	9.2	3.40	1.65	0.08	0.14	0.03	42.0	57.0	20
Min.	29.5	124.0	6.3	7.7	0.36	0.10	0.01	0.10	0.01	35.0	42.0	5
Mean	30.4	128.2	8.4	8.4	0.97	0.79	0.03	0.10	0.01	38.3	51.3	12
1.0 m												
Max.	31.0	139.0	9.7	9.0	.	.	.	.	.	.	.	.
Min.	29.4	123.0	4.9	7.4	.	.	.	.	.	.	.	.
Mean	30.0	129.0	7.2	8.2	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.8	131.0	7.9	8.3	27.00	1.65	0.08	0.10	0.01	43.0	55.0	65
Min.	29.3	127.0	4.3	7.3	0.41	0.10	0.01	0.10	0.01	38.0	50.0	5
Mean	29.8	128.8	5.8	7.9	3.13	0.86	0.04	0.10	0.01	40.3	52.6	18
Bottom**												
Max.	30.8	172.0	6.6	8.3	5.20	2.30	0.11	0.13	0.03	43.0	55.0	60
Min.	29.1	124.0	0.3	6.6	0.74	0.80	0.02	0.10	0.01	40.0	52.0	10
Mean	29.8	135.8	3.9	7.3	1.92	1.35	0.05	0.11	0.02	41.3	53.0	24
					BUFFER 8							
0.3 m												
Max.	31.6	151.0	10.4	9.0	1.10	0.92	0.12	0.15	0.02	42.0	53.0	15
Min.	29.5	125.0	4.8	7.2	0.34	0.40	0.01	0.10	0.01	38.0	36.0	10
Mean	30.4	129.2	8.0	8.3	0.58	0.21	0.04	0.10	0.01	39.7	49.7	10
1.0 m												
Max.	30.9	140.0	8.4	8.6	.	.	.	.	.	.	.	.
Min.	29.5	123.0	4.6	7.2	.	.	.	.	.	.	.	.
Mean	30.2	128.8	7.5	8.2	.	.	.	.	.	.	.	.
2.0 m												
Max.	30.8	139.0	8.6	8.5	0.85	1.50	0.08	0.15	0.02	41.0	58.0	20
Min.	29.4	128.0	4.2	7.1	0.20	0.20	0.01	0.10	0.01	38.0	50.0	10
Mean	29.8	129.0	6.5	7.9	0.81	0.89	0.04	0.11	0.01	40.3	53.7	19
Bottom**												
Max.	30.4	148.0	4.9	7.5	9.70	1.70	0.40	0.14	0.05	45.0	64.0	35
Min.	28.5	126.0	0.1	6.8	0.35	0.15	0.02	0.10	0.01	39.0	51.0	10
Mean	29.4	158.2	1.9	7.0	1.97	1.15	0.07	0.12	0.02	41.3	55.3	20

** 0.5 m above sediment.

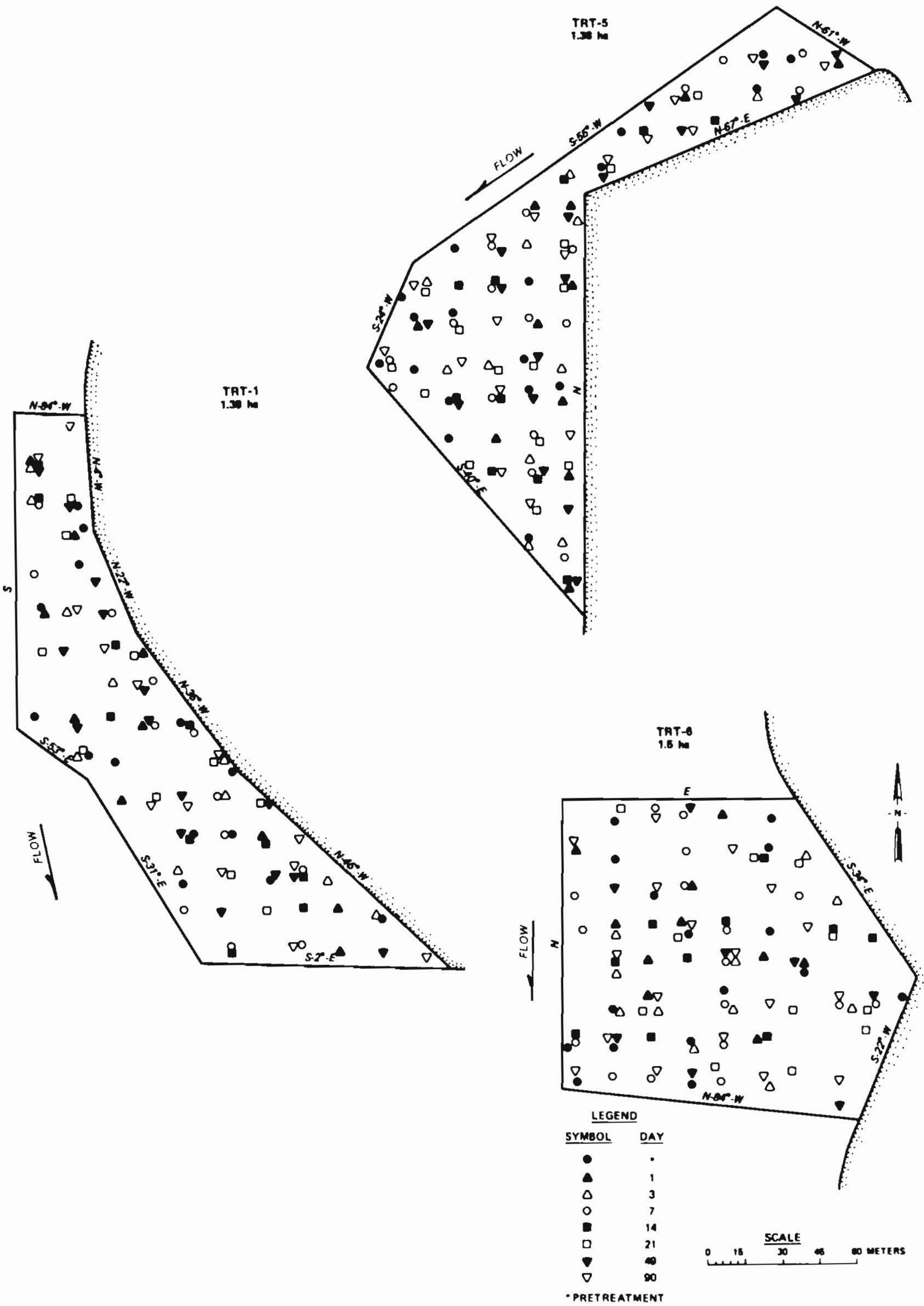
Table 9

Statistical t-Test Comparing Treatment and Reference Plot Mean Cell-Pack Volume Through Posttreatment Day 49

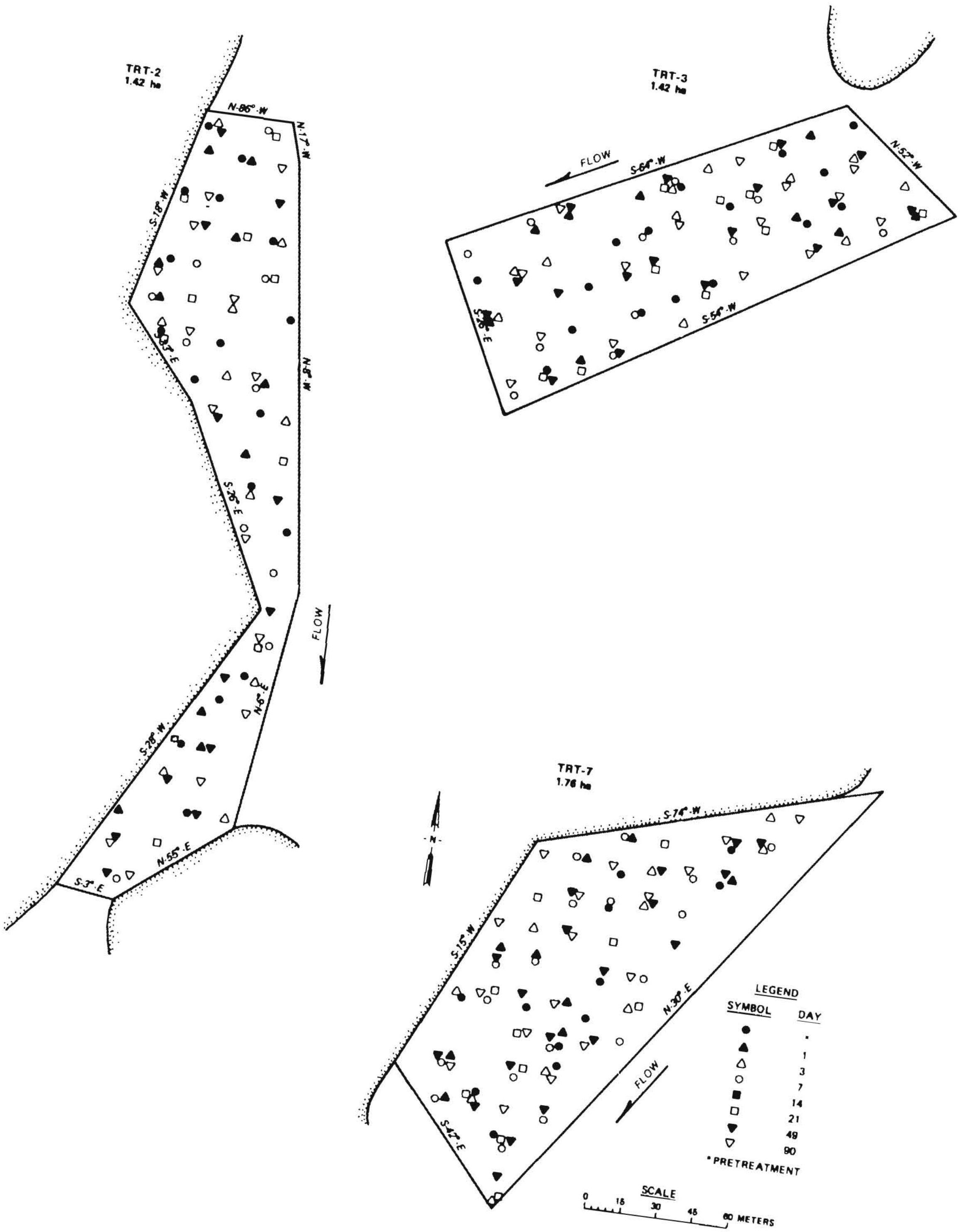
Treatment Plots Compared	Pretreatment	Posttreatment, days				
		1	3	7	21	49
REF-8 + TRT-4	2.398*	1.089	0.548	1.565	1.131	2.375*
REF-8 + TRT-1	0.465	0.938	1.513	2.594*	0.198	4.642**
REF-8 + TRT-6	1.995	2.086	1.492	1.325	0.964	5.245**
REF-8 + TRT-5	2.951**	2.046	1.937	1.109	1.930	6.754**
REF-8 + TRT-3	2.285	0.131	1.293	0.386	1.450	6.094**
REF-8 + TRT-7	2.056	0.371	1.017	2.742	0.466	2.846*
REF-8 + TRT-2	0.919	0.658	1.260	2.849	1.606	4.431**

* Level of significance at $P < 0.05$.
** Level of significance at $P < 0.02$.

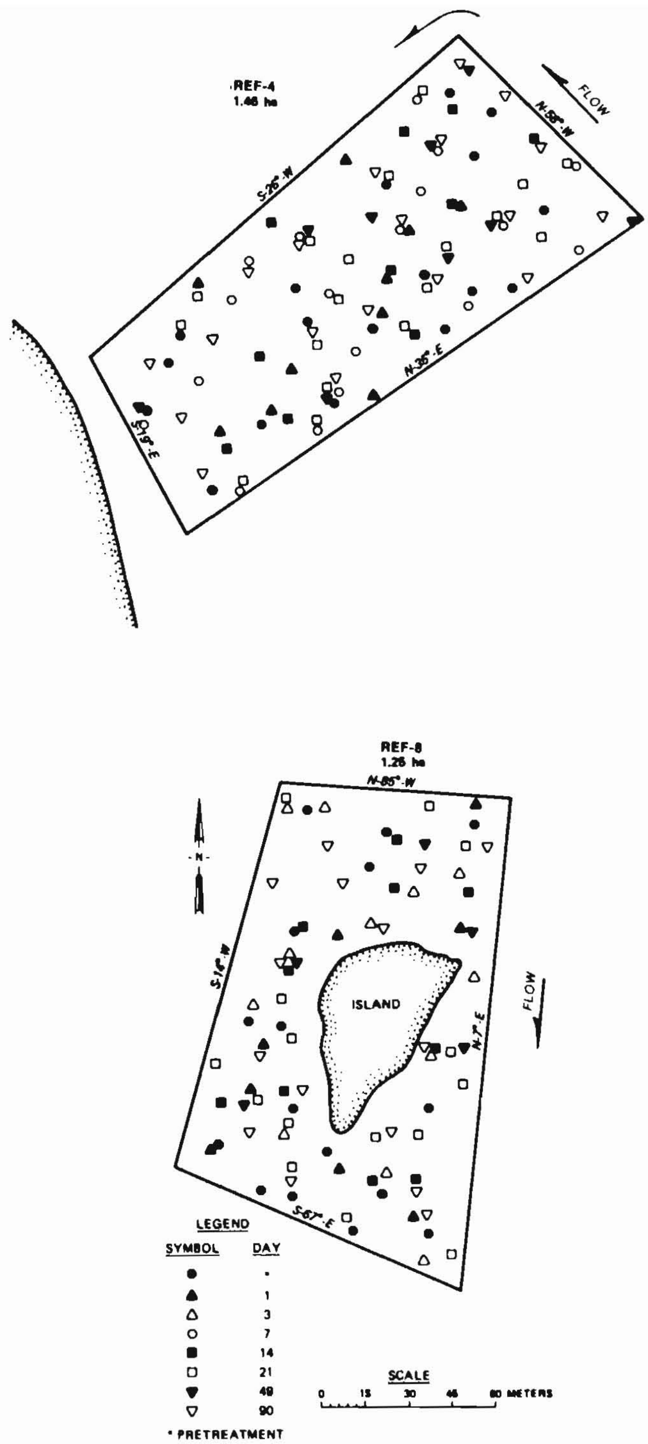
APPENDIX A: SAMPLING LOCATIONS



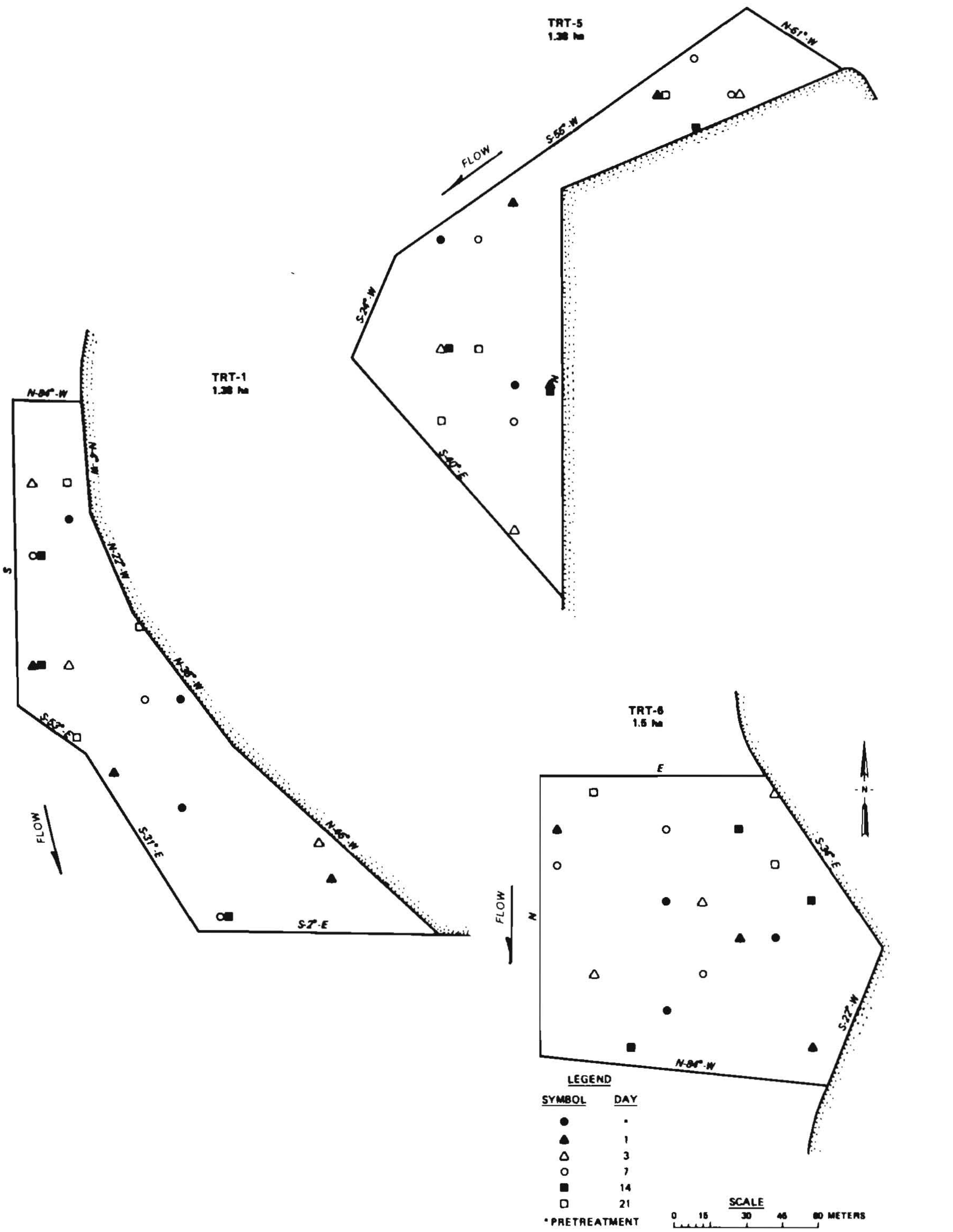
Hydrilla Biomass



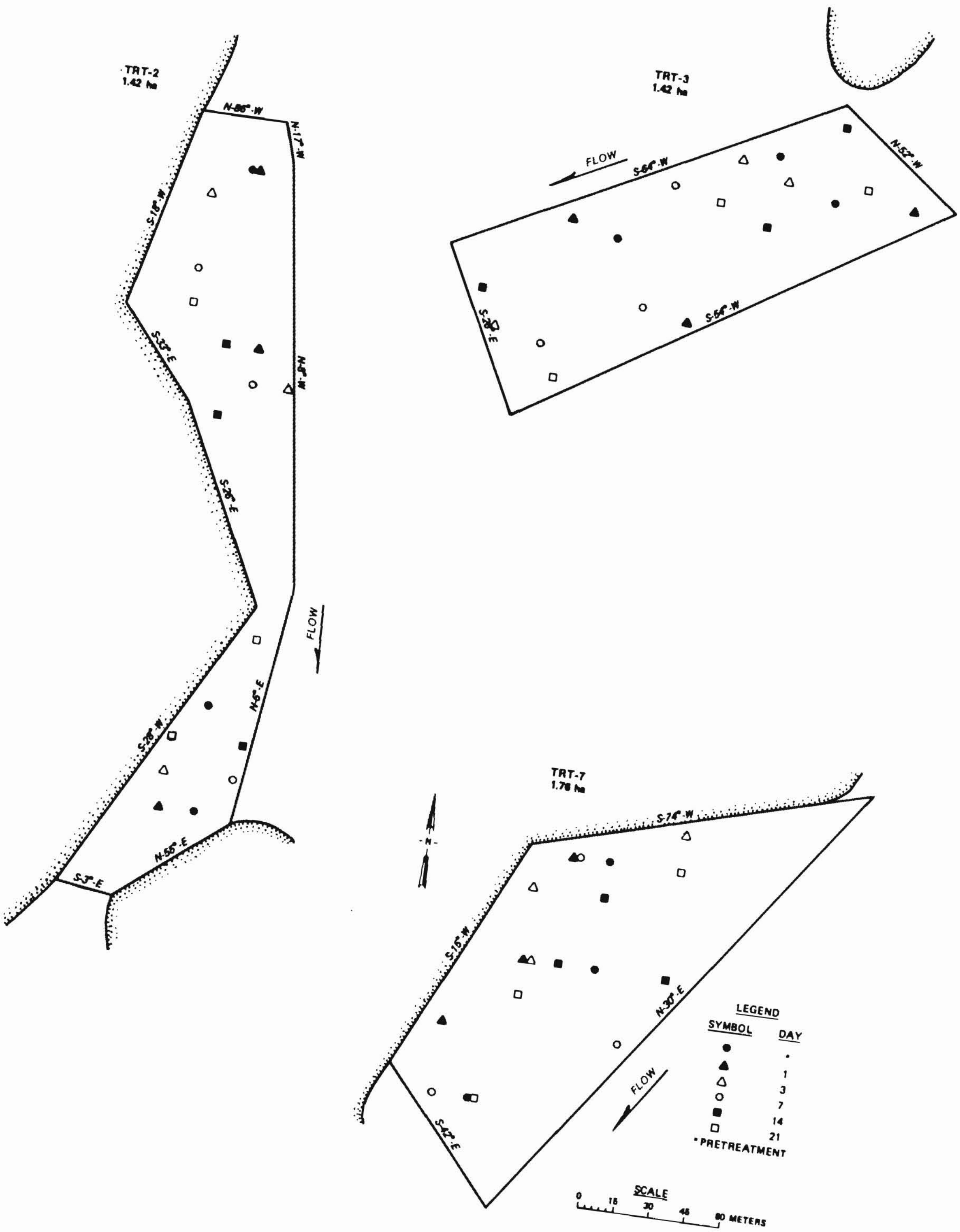
Hydrilla Biomass



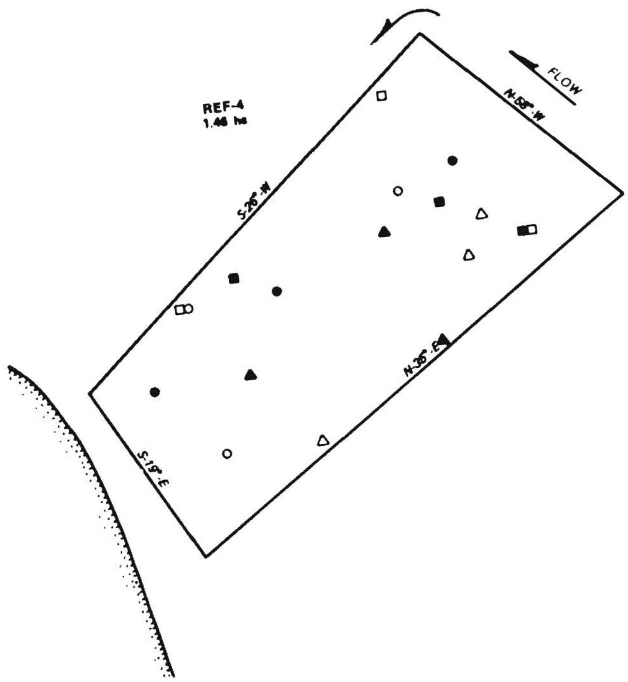
Hydrilla Biomass

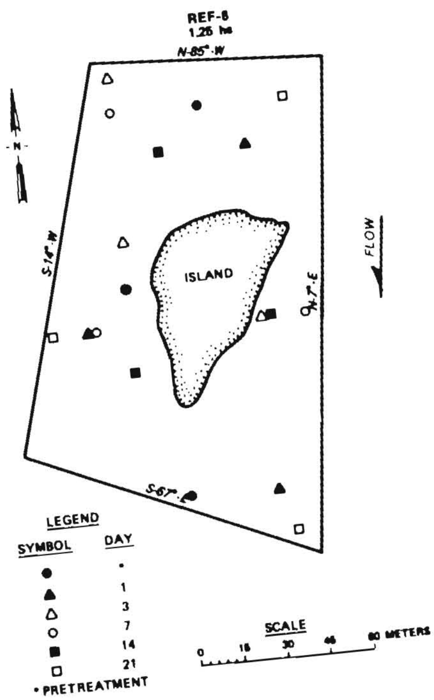


Water Quality and Endothall Residue in Water

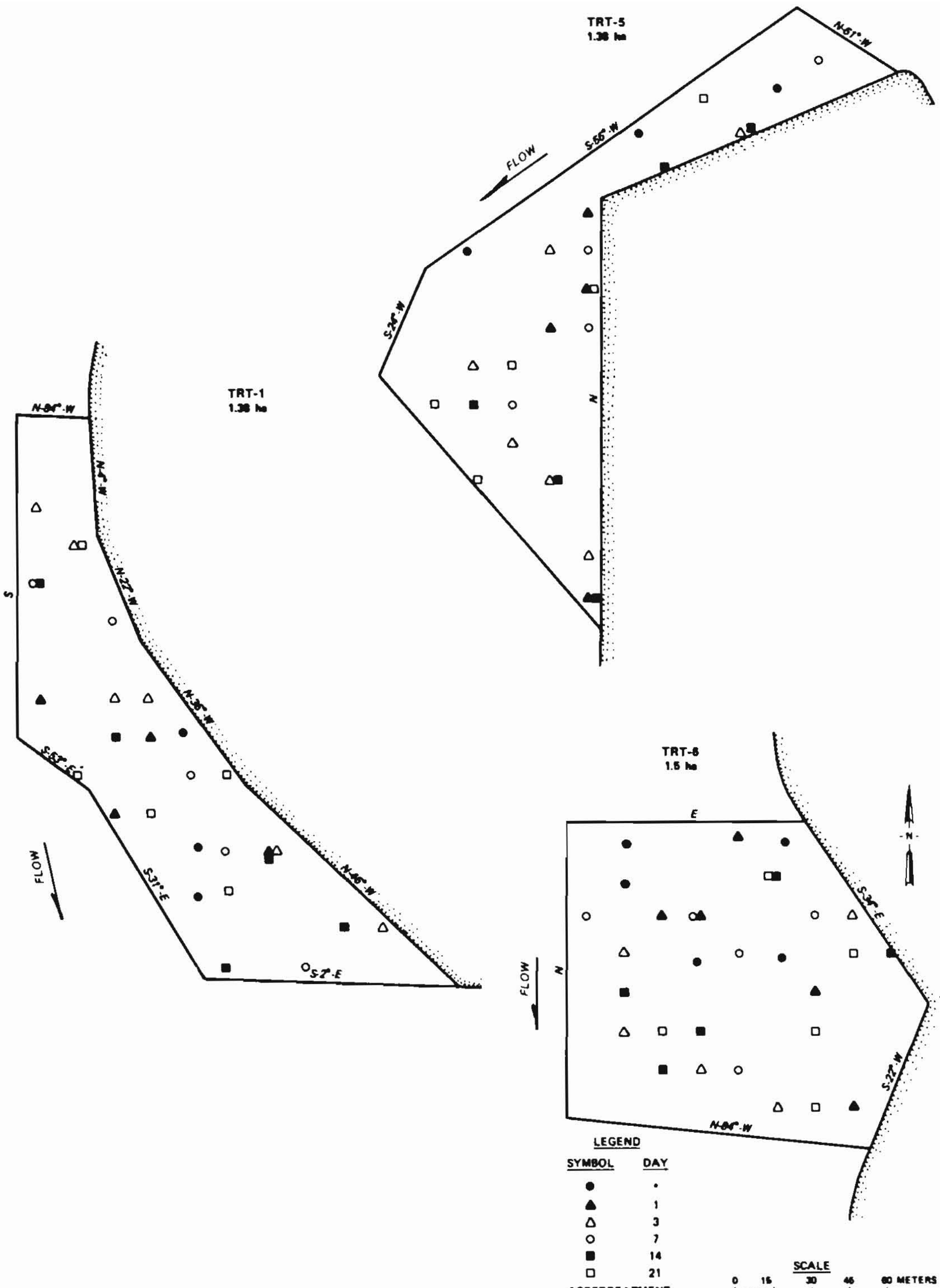


Water Quality and Endothall Residue in Water

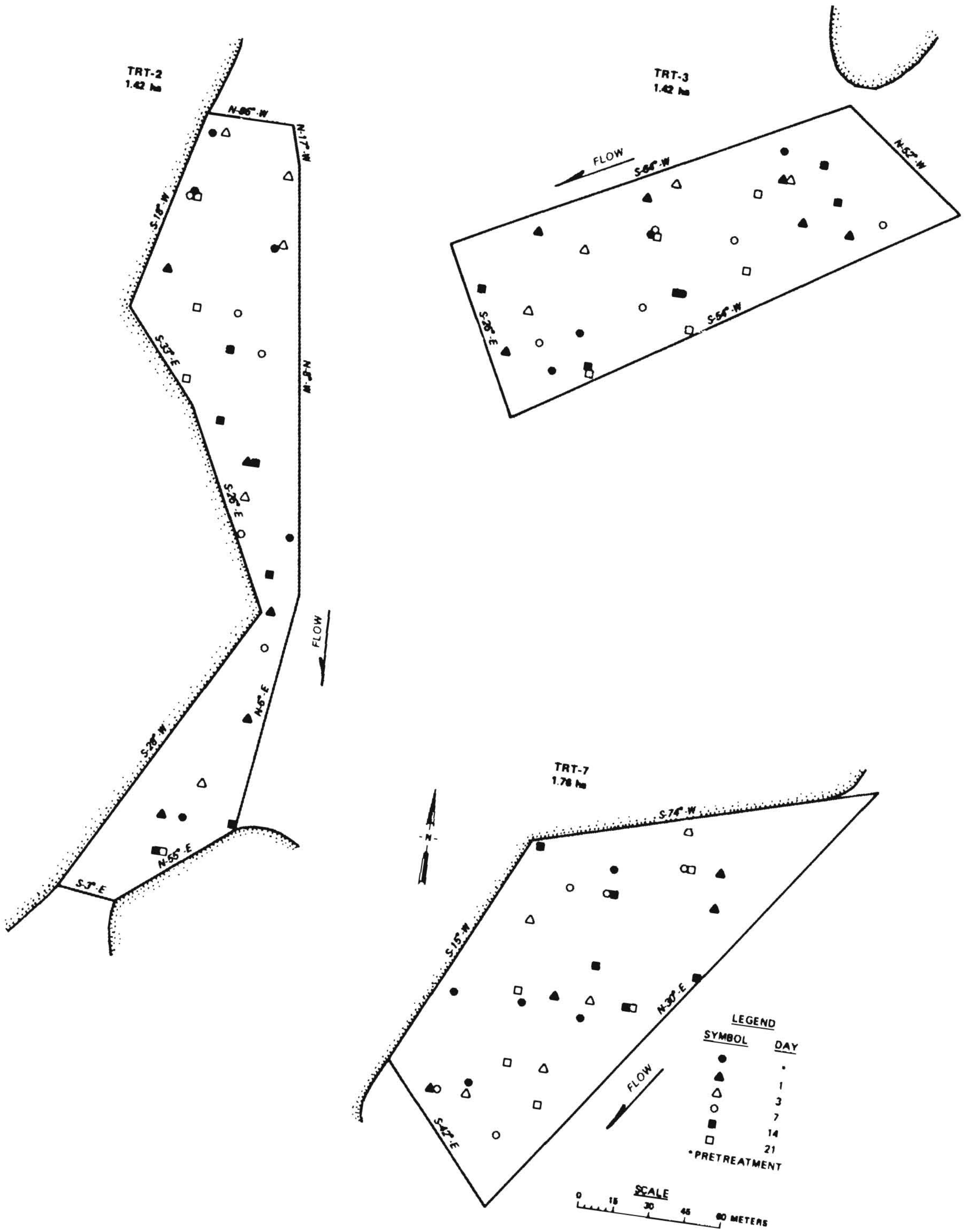




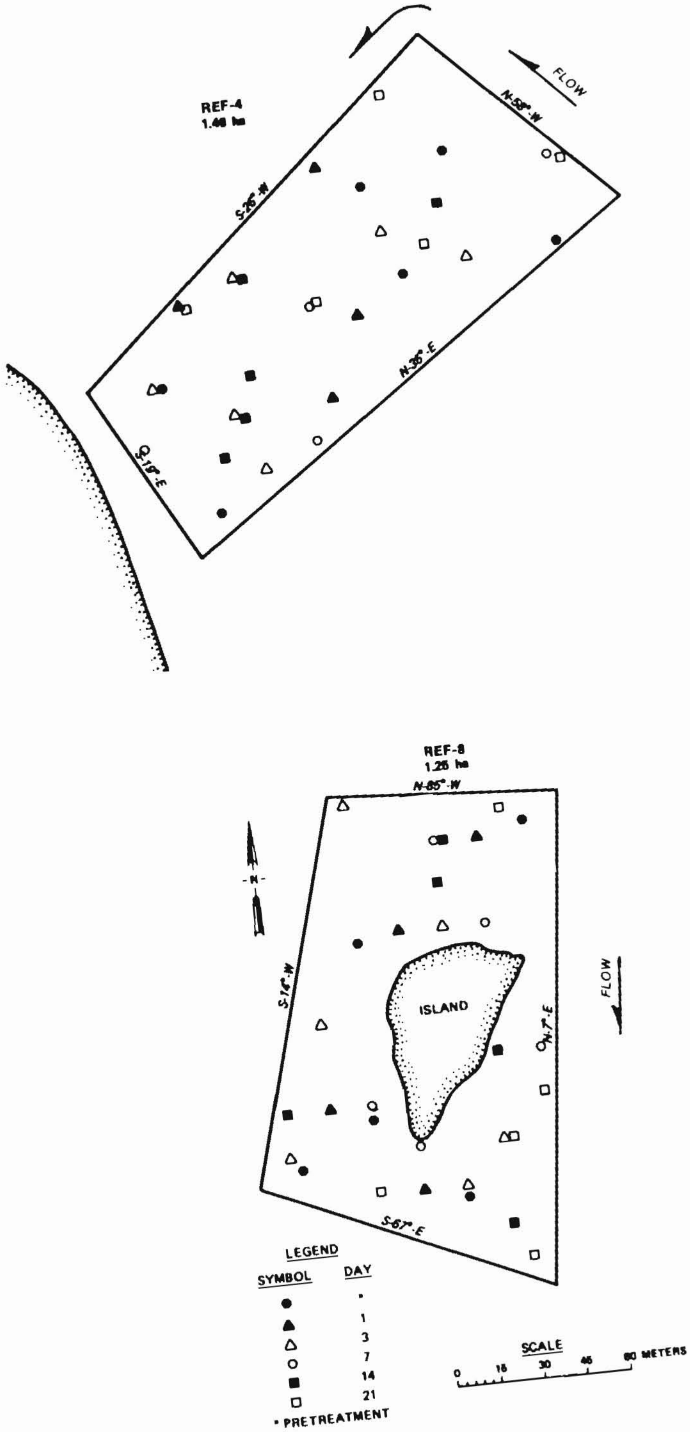
Water Quality and
Endothall Residue
in Water



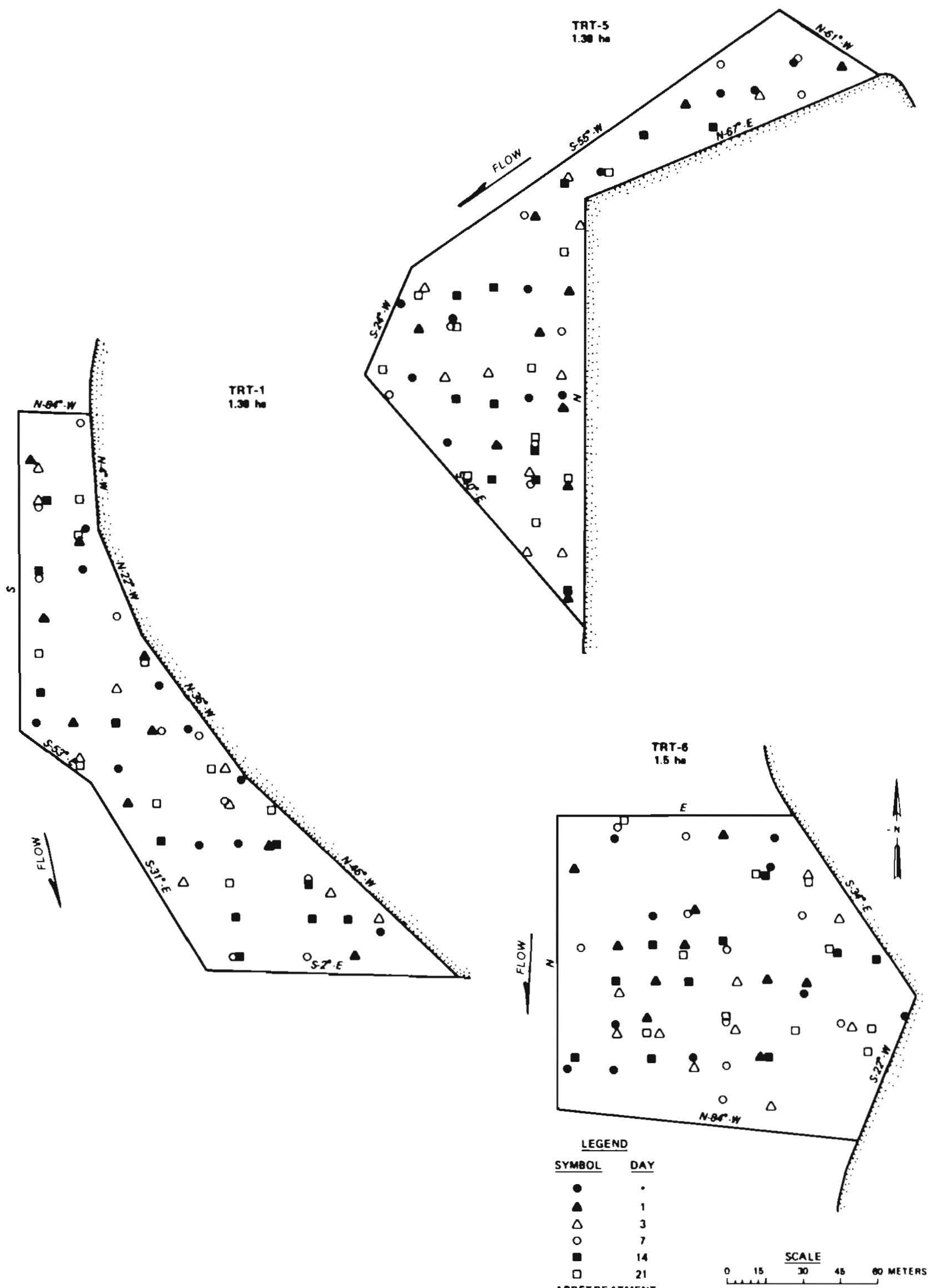
Endothall Residue in Sediment



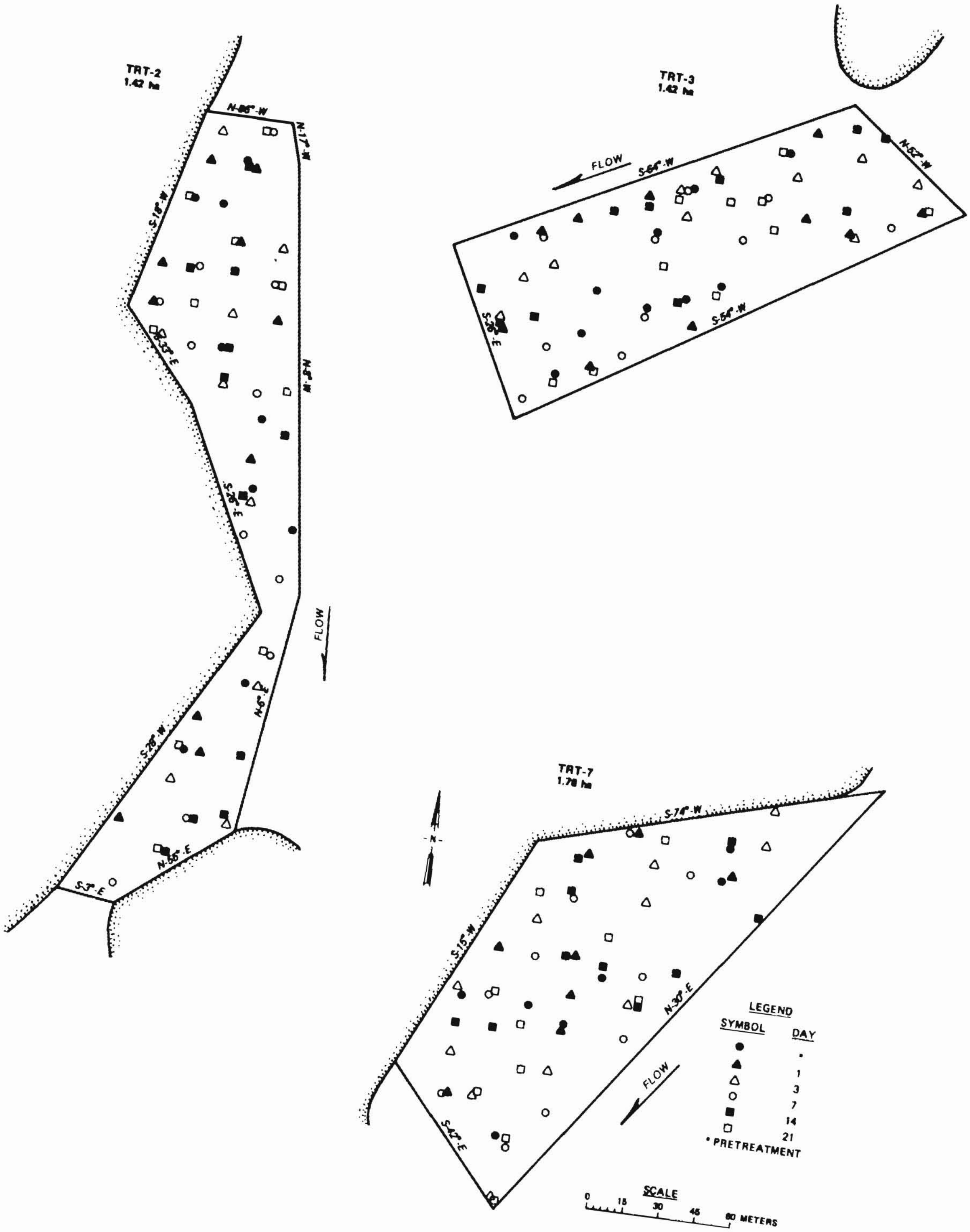
Endothall Residue in Sediment



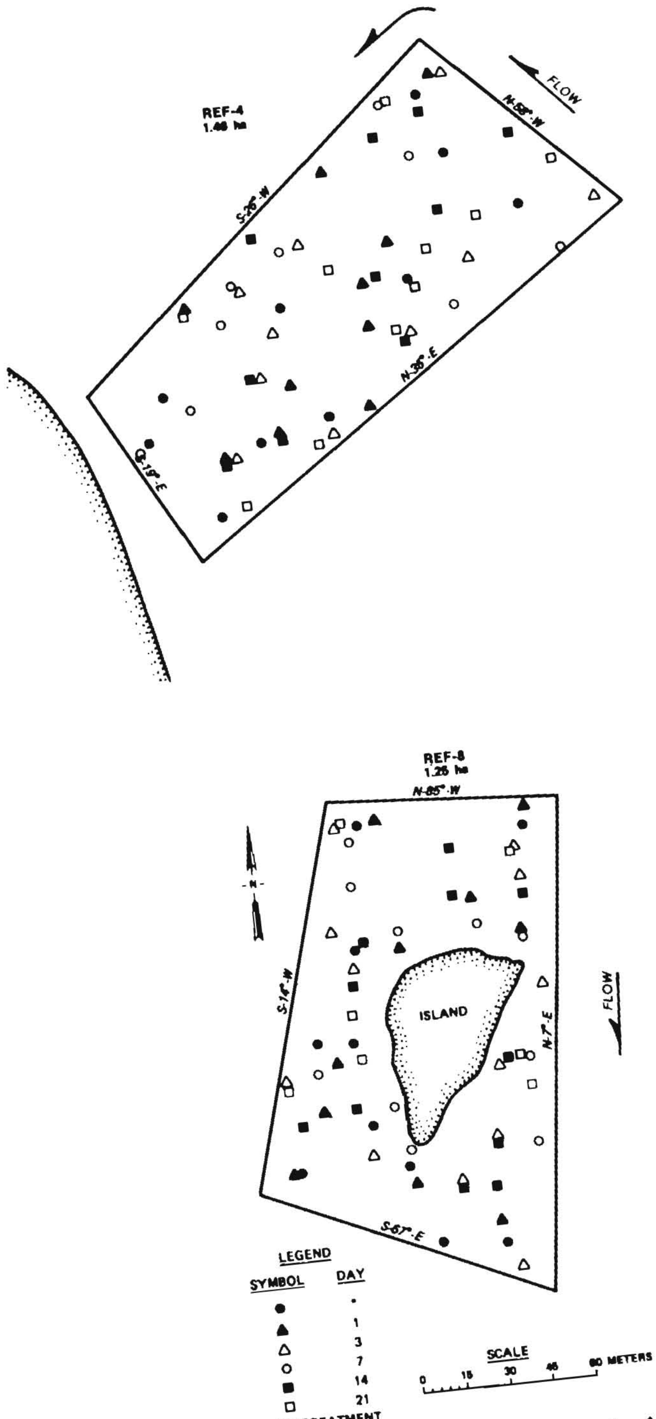
Endothall Residue in Sediment



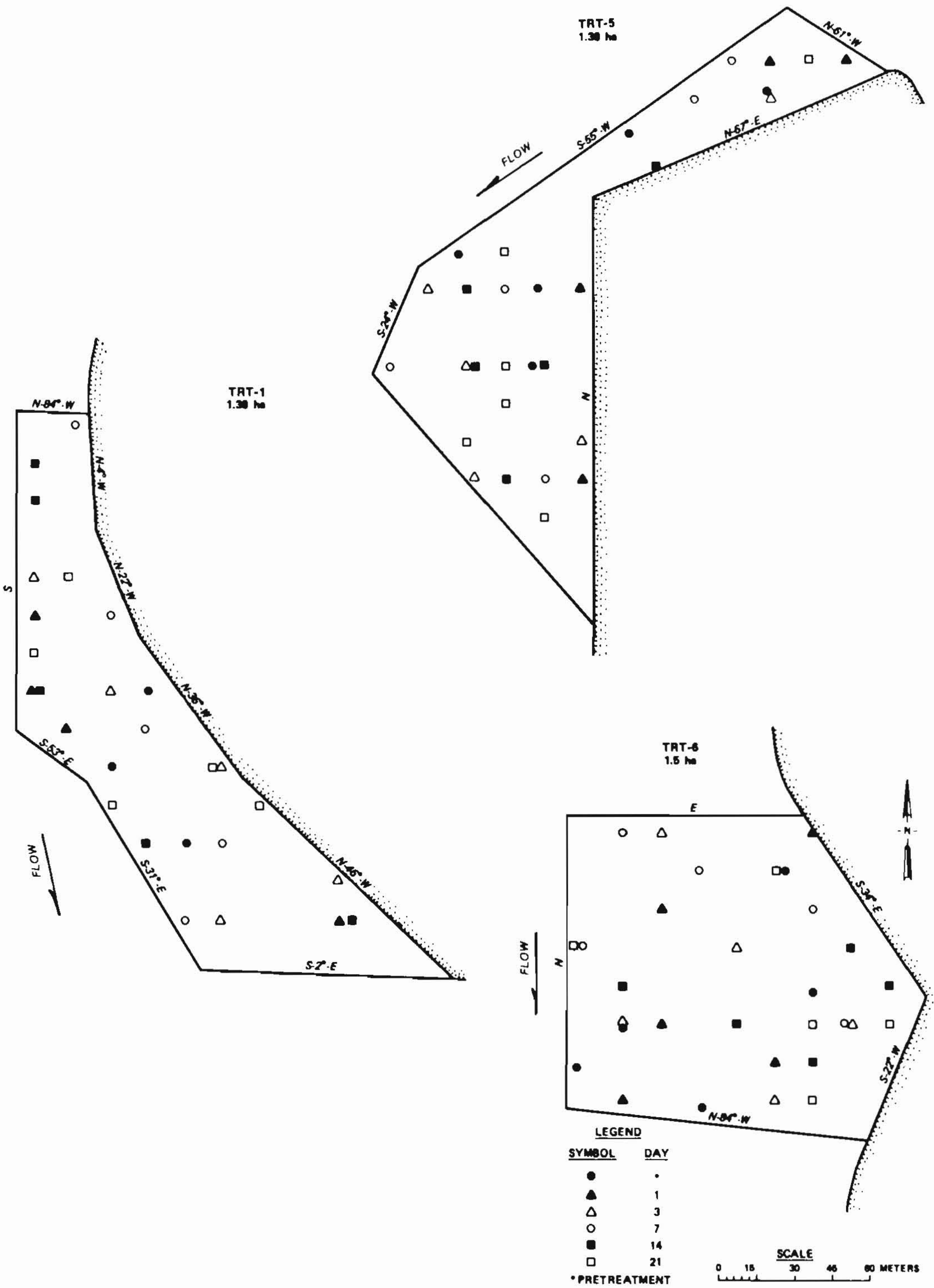
Endothall Residue in Plants



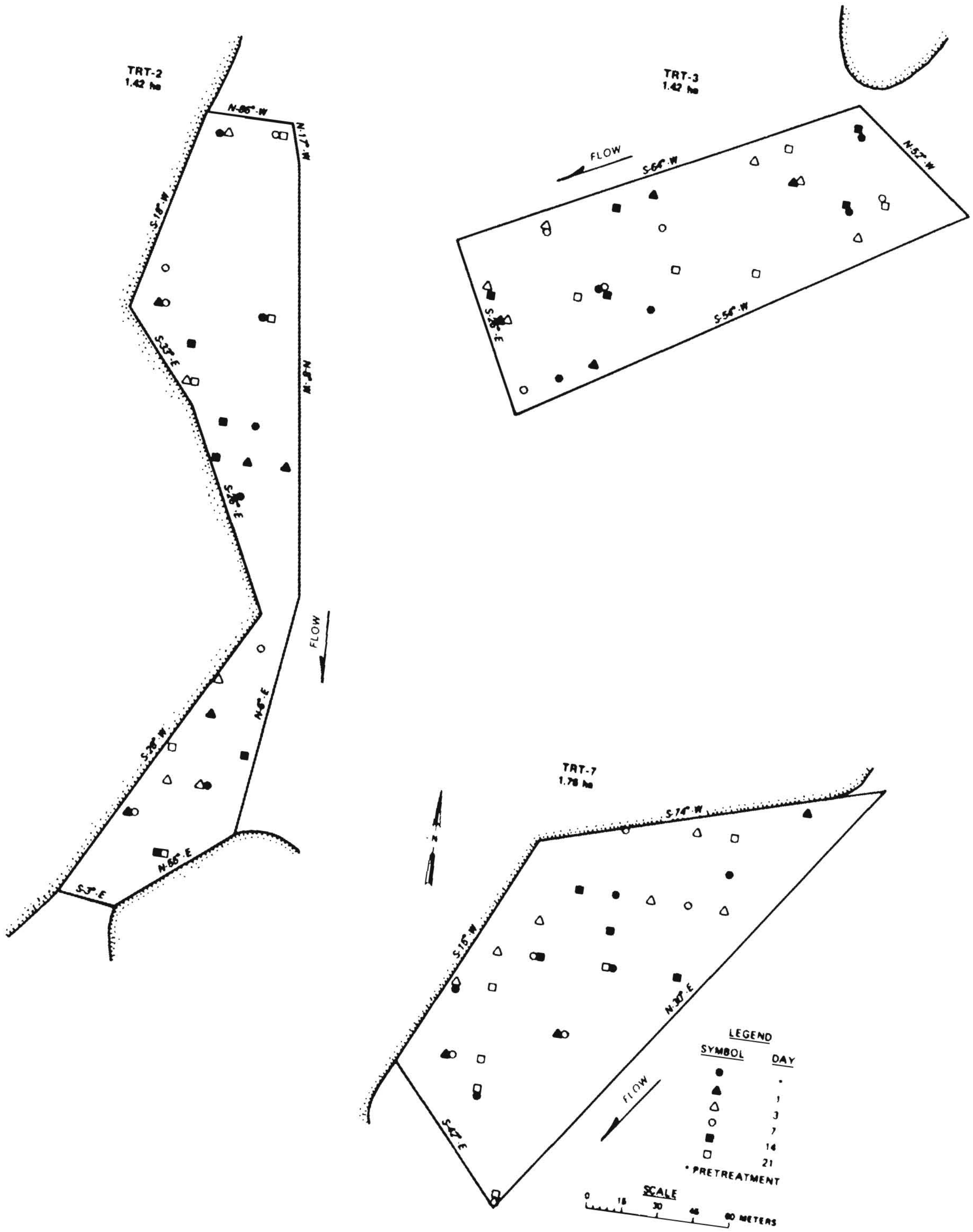
Endothall Residue in Plants



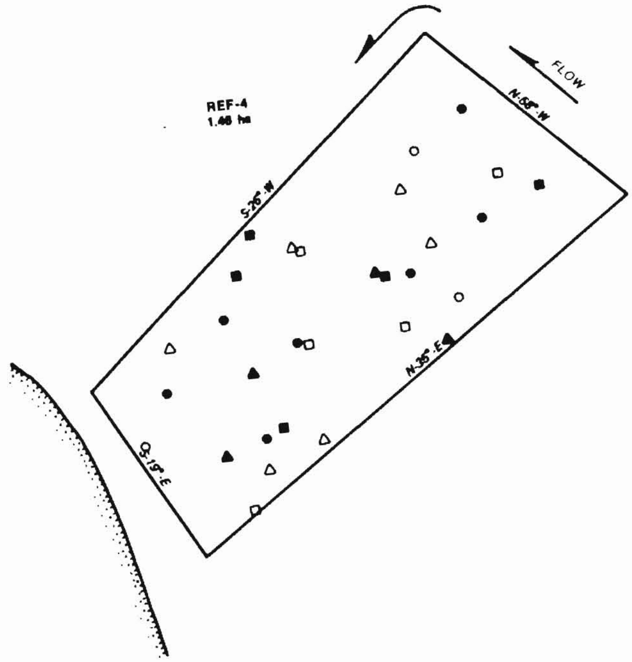
Endothall Residue in Plants

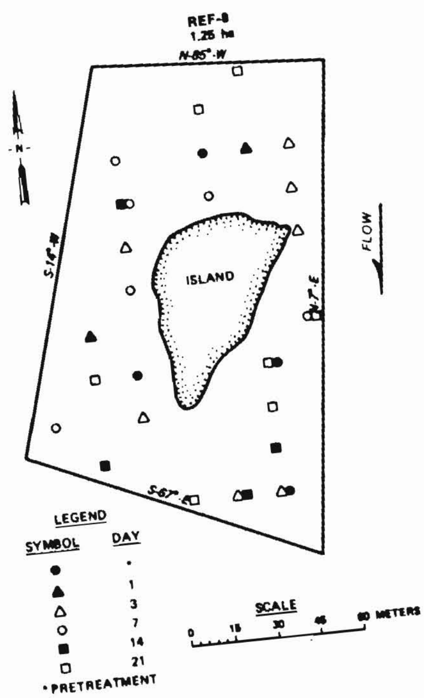


Plankton sampl.



Plankton Sample





Plankton sample

APPENDIX B: HYDRILLA BIOMASS

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
412	1		3.7	850.6	3186.1	871.1
412	1		4.0	538.7	2017.9	509.3
412	1		4.6	1077.4	4035.7	882.7
412	1		5.2	1133.1	4248.1	819.8
412	1		3.7	623.8	2336.5	638.8
412	1		3.4	1474.4	5522.6	1647.2
412	1		5.5	1162.5	4354.3	793.7
412	1		4.9	992.4	3717.1	762.2
412	1		4.0	567.1	2124.1	536.1
412	1		2.1	708.8	2655.1	1244.4
412	1		2.9	850.6	3186.1	1100.3
412	1		4.3	907.3	3398.5	796.4
412	1		3.8	822.2	3079.9	808.4
412	1		5.5	1701.2	6372.2	1161.5
412	1		4.9	1474.4	5522.6	1132.4
420	1		3.7	907.3	3398.5	929.2
420	1		4.1	226.8	849.6	206.5
420	1		4.9	964.0	3610.9	740.4
420	1		3.4	850.6	3186.1	950.3
420	1		5.2	680.5	2548.9	491.9
420	1		4.3	822.2	3079.9	721.8
420	1		4.0	1190.8	4460.5	1125.7
420	1		2.4	1474.4	5522.6	2264.8
420	1		4.9	765.5	2867.5	588.0
420	1		5.2	850.6	3186.1	614.9
423	1		4.0	453.6	1699.3	428.8
423	1		4.0	765.5	2867.5	723.7
423	1		4.3	680.5	2548.9	597.3
423	1		2.7	283.5	1062.0	387.2
423	1		4.9	396.9	1486.8	304.9
423	1		2.7	453.6	1699.3	619.4
423	1		1.8	226.8	849.6	464.6
423	1		2.1	964.0	3610.9	1692.4
423	1		2.7	453.6	1699.3	619.4
423	1		3.7	1757.9	6584.6	1800.3
426		1	4.0	0.0	0.0	0.0
426		1	5.5	0.0	0.0	0.0
426		1	5.5	0.0	0.0	0.0
426		1	5.2	737.2	2761.3	532.9
426	1		4.0	396.9	1486.8	375.2
426	1		5.2	226.8	849.6	164.0
426	1		4.6	850.6	3186.1	696.9
426	1		4.9	396.9	1486.8	304.9
426	1		3.7	1020.7	3823.3	809.3
426	1		2.1	737.2	2761.3	1294.2
426	1		3.0	793.9	2973.7	975.6
426	1		2.7	964.0	3610.9	1316.3
426	1		4.3	793.9	2973.7	696.9
426	1		4.3	340.2	1274.4	298.7
426	1		5.3	850.6	3186.1	597.3
503	1		4.3	567.1	2124.1	497.8
503	1		4.6	1077.4	4035.7	882.7
503	1		4.3	680.5	2548.9	597.3

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
503	1		4.9	482.0	1805.5	370.2
503	1		4.6	368.6	1380.6	302.0
503	1		2.7	907.3	3398.5	1238.9
503	1		3.0	396.9	1486.8	487.8
503	1		2.4	793.9	2973.7	1219.5
503	1		2.7	396.9	1486.8	542.0
503	1		5.2	765.5	2867.5	553.4
510		1	4.0	0.0	0.0	0.0
510		1	6.4	0.0	0.0	0.0
510		1	5.2	0.0	0.0	0.0
510	1		3.4	0.0	0.0	0.0
510	1		3.7	0.0	0.0	0.0
510	1		3.0	0.0	0.0	0.0
510	1		5.2	0.0	0.0	0.0
510	1		2.4	0.0	0.0	0.0
510	1		2.4	0.0	0.0	0.0
510	1		3.7	0.0	0.0	0.0
510	1		2.4	0.0	0.0	0.0
510	1		4.6	0.0	0.0	0.0
510	1		5.2	0.0	0.0	0.0
607	1		4.0	0.0	0.0	0.0
607	1		3.0	0.0	0.0	0.0
607	1		2.7	0.0	0.0	0.0
607	1		3.0	0.0	0.0	0.0
607	1		4.9	0.0	0.0	0.0
607	1		2.7	0.0	0.0	0.0
607	1		5.2	283.5	1062.0	205.0
607	1		5.5	283.5	1062.0	193.6
607	1		2.1	0.0	0.0	0.0
607	1		3.0	56.7	212.4	69.7
607	1		3.0	28.4	106.2	34.8
607	1		2.7	170.1	637.2	232.3
607	1		3.4	56.7	212.4	63.4
607	1		4.3	141.8	531.0	124.4
607	1		4.9	368.6	1380.6	283.1
715	1		3.7	283.5	1062.0	290.4
716	1		4.6	56.7	212.4	46.5
716	1		4.9	28.4	106.2	21.8
716	1		4.0	0.0	0.0	0.0
715	1		3.4	453.6	1699.3	506.8
716	1		1.8	56.7	212.4	116.1
715	1		2.1	141.8	531.0	248.9
716	1		3.0	28.4	106.2	34.8
715	1		1.8	567.1	2123.1	1161.5
716	1		2.4	1360.9	5097.8	2090.6
716	1		3.4	737.2	2761.3	823.6
716	1		5.5	1332.6	4991.6	909.8
716	1		5.5	1446.0	5416.4	987.2
415		2	3.7	396.9	1486.8	406.5
415		2	4.9	963.0	3610.9	740.4
415		2	5.2	141.8	531.0	102.5
415	2		4.6	850.6	3186.1	696.9
415	2		4.9	737.2	2761.3	566.2

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
415	2		4.7	538.7	2017.9	427.1
415	2		4.0	964.0	3610.9	911.3
415	2		4.4	1417.6	5310.2	1201.5
415	2		4.9	793.9	2973.7	609.8
415	2		4.6	1190.8	4460.5	975.6
415	2		3.4	1020.7	3823.3	1140.3
415	2		3.7	878.9	3292.3	900.1
415	2		4.9	708.8	2655.1	544.4
415	2		4.6	765.5	2867.5	627.2
415	2		3.4	1105.8	4141.9	1235.4
415	2		4.3	964.0	3610.9	846.2
415	2		2.7	1616.1	6053.6	2206.8
415	2		4.0	1332.6	4991.6	1259.7
415	2		4.3	822.2	3079.9	721.8
415	2		2.3	737.2	2761.3	1207.9
419	2		2.7	907.3	3398.5	1238.9
419	2		5.2	28.4	106.2	20.5
419	2		4.6	510.4	1911.7	418.1
419	2		4.3	1360.9	5097.8	1194.6
419	2		4.9	964.0	3610.9	740.4
419	2		2.7	964.0	3610.9	1316.3
419	2		3.7	453.6	1699.3	464.6
419	2		3.0	1049.1	3929.5	1289.2
419	2		4.3	907.3	3398.5	796.4
419	2		4.3	453.6	1699.3	398.2
421	2		4.3	680.5	2548.9	597.3
421	2		4.6	1332.6	4991.6	1091.8
421	2		4.9	1389.3	5204.0	1067.1
421	2		4.6	1360.9	5097.8	1115.0
421	2		5.2	1502.7	5624.8	1086.3
421	2		5.2	1417.6	5310.2	1024.8
421	2		3.4	992.4	3717.1	1108.7
421	2		4.9	1105.8	4141.9	849.3
421	2		4.9	793.9	2973.7	609.8
421	2		2.7	737.2	2761.3	1006.6
425	2		18.3	1020.7	3823.3	209.1
425	2		4.0	1190.8	4460.5	1125.7
425	2		2.7	1247.5	4672.9	1703.5
425	2		3.7	1360.9	5097.8	1393.7
425	2		4.3	2268.2	8496.3	1991.1
425	2		3.7	1020.7	3823.3	1045.3
425	2		3.4	1105.8	4141.9	1235.4
425	2		4.9	226.8	849.6	174.2
425	2		4.6	1360.9	5097.8	1115.0
425	2		3.7	340.2	1274.4	348.4
509		2	4.3	680.5	2548.9	597.3
509		2	5.8	510.4	1911.7	330.1
509		2	5.8	623.8	2336.5	403.5
509	2		4.9	396.9	1486.8	304.9
509	2		4.6	340.2	1274.4	278.7
509	2		4.0	680.5	2548.9	643.3
509	2		4.3	907.3	3398.5	796.4
509	2		4.6	907.3	3398.5	743.3

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
509	2		4.6	964.0	3610.9	789.8
509	2		4.9	1247.5	4672.9	958.2
509	2		4.6	680.5	2548.9	557.5
509	2		3.7	680.5	2548.9	696.9
509	2		3.4	623.8	2336.5	695.9
606	2		3.4	510.4	1911.7	570.2
606	2		4.3	1531.1	5735.0	1344.0
606	2		5.2	737.2	2761.3	532.9
606	2		4.6	226.8	849.6	185.8
606	2		4.9	226.8	849.6	174.2
606	2		4.6	708.8	2655.1	580.7
606	2		4.0	0.0	0.0	0.0
606	2		5.2	56.7	212.4	41.0
606	2		4.9	878.9	3292.3	675.1
606	2		4.6	0.0	0.0	0.0
606	2		4.0	0.0	0.0	0.0
606	2		3.7	0.0	0.0	0.0
716	2		4.0	56.7	212.4	53.6
716	2		4.3	85.1	318.6	74.7
716	2		4.6	0.0	0.0	0.0
716	2		4.9	0.0	0.0	0.0
716	2		3.7	170.1	637.2	174.2
716	2		4.9	28.4	106.2	21.8
716	2		4.9	85.1	318.6	65.3
716	2		5.2	28.4	106.2	20.5
716	2		3.4	1559.4	5841.2	1742.2
716	2		2.1	0.0	0.0	0.0
716	2		5.2	0.0	0.0	0.0
716	2		4.6	56.7	212.4	46.5
716	2		4.0	28.4	106.2	26.8
716	2		4.9	28.4	106.2	21.8
716	2		5.2	567.1	2124.1	409.9
716	2		3.0	680.5	2548.9	836.2
716	2		3.0	56.7	212.4	69.7
415	3		4.0	907.3	3398.5	857.7
415	3		3.4	0.0	0.0	0.0
415	3		3.7	1417.6	5310.2	1451.8
415	3		3.4	510.4	1911.7	570.2
415	3		2.7	907.3	3398.5	1238.9
415	3		2.7	850.6	3186.1	1161.5
415	3		2.7	1304.2	4885.4	1780.9
415	3		2.7	1247.5	4672.9	1703.5
415	3		2.7	1360.9	5097.8	1858.3
415	3		4.3	737.2	2761.3	647.1
415	3		2.7	1134.1	4248.1	1548.6
415	3		4.3	793.9	2973.7	696.9
415	3		2.7	850.6	3186.1	1161.5
415	3		4.6	1077.4	4035.7	882.7
415	3		2.4	680.5	2548.9	1045.3
415	3		3.0	510.4	1911.7	627.2
415	3		4.3	1417.6	5310.2	1244.4
419	3		4.0	680.5	2548.9	643.3
419	3		3.2	964.0	3610.9	1128.3

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
419	3		4.0	850.6	3186.1	804.1
419	3		4.0	1360.9	5097.8	1286.5
419	3		3.8	793.9	2973.7	780.5
419	3		3.7	1134.1	4248.1	1161.5
419	3		2.7	482.0	1805.5	658.2
419	3		4.3	1077.4	4035.7	945.8
419	3		2.4	1077.4	4035.7	1655.1
419	3		2.7	482.0	1805.5	658.2
421	3		3.0	1020.7	3823.3	1254.4
421	3		3.4	1219.2	4566.7	1362.1
421	3		2.7	1871.3	7009.4	2555.2
421	3		4.4	1360.9	5097.8	1153.4
421	3		4.3	510.4	1911.7	448.0
421	3		4.6	595.4	2230.3	487.8
421	3		4.0	1304.2	4885.4	1232.9
421	3		3.0	708.8	2655.1	871.1
421	3		3.0	623.8	2336.5	766.6
421	3		4.0	1531.1	5735.0	1447.4
425	3		3.0	850.6	3186.1	1045.3
425	3		5.2	1304.2	4885.4	942.8
425	3		3.7	765.5	2867.5	784.0
425	3		3.4	283.5	1062.0	316.8
425	3		2.7	1275.9	4779.2	1742.2
425	3		2.4	1417.6	5310.2	2177.7
425	3		4.3	1502.7	5628.8	1319.1
425	3		4.9	1389.3	5204.0	1067.1
425	3		3.4	1134.1	4248.1	1267.0
425	3		4.6	1587.8	5947.4	1300.8
425	3		2.7	567.1	2124.1	774.3
509	3		3.7	793.9	2973.7	813.0
509	3		3.4	623.8	2336.5	696.9
509	3		2.7	453.6	1699.3	619.4
509	3		3.0	510.4	1911.7	627.2
509	3		4.3	482.0	1805.5	423.1
509	3		4.0	907.3	3398.5	857.7
509	3		3.0	737.2	2761.3	905.9
509	3		4.0	680.5	2548.9	643.3
509	3		4.6	453.6	1699.3	371.7
509	3		3.7	396.9	1486.8	406.5
606	3		3.7	198.5	743.4	203.3
606	3		4.0	1105.8	4141.9	1045.3
606	3		3.7	680.5	2548.9	696.9
606	3		5.2	538.7	2017.9	389.4
606	3		3.4	538.7	2017.9	601.8
606	3		4.6	1701.2	6372.2	1393.7
606	3		3.7	1616.1	6053.6	1655.1
606	3		3.0	482.0	1805.5	592.3
606	3		4.6	1275.9	4779.2	1045.3
606	3		3.4	992.4	3717.1	1108.7
606	3		3.0	822.2	3079.9	1010.5
606	3		3.0	793.9	2973.7	975.6
606	3		4.3	680.5	2548.9	597.3
606	3		3.0	0.0	0.0	0.0

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
606	3		4.0	56.7	212.4	53.6
605	3		3.7	85.1	318.6	87.1
606	3		4.0	0.0	0.0	0.0
717	3		3.4	708.8	2655.1	791.9
717	3		4.0	623.8	2336.5	589.7
717	3		3.4	368.6	1380.6	411.8
717	3		2.7	141.8	531.0	193.6
717	3		3.7	28.4	106.2	29.0
717	3		4.6	822.2	3079.9	673.6
717	3		3.4	1134.1	4248.1	1267.0
717	3		3.0	113.4	424.8	139.4
717	3		3.4	28.4	106.2	31.7
717	3		2.7	0.0	0.0	0.0
717	3		2.7	28.4	106.2	38.7
717	3		3.0	0.0	0.0	0.0
717	3		3.4	56.7	212.4	63.4
717	3		3.7	113.4	424.8	116.1
717	3		3.1	28.4	106.2	31.7
717	3		3.4	510.4	1911.7	570.2
717	3		4.9	0.0	0.0	0.0
415		4	5.8	567.1	2124.1	366.8
415		4	6.1	0.0	0.0	0.0
415		4	1.8	226.8	849.6	464.6
415	4		3.7	1332.6	4991.6	1364.7
415	4		4.0	1757.9	6584.6	1661.8
415	4		4.4	1020.7	3823.3	865.1
415	4		1.5	538.7	2017.9	1324.1
415	4		4.4	793.9	2973.7	672.8
415	4		4.7	1587.8	5947.4	1258.9
415	4		4.9	1531.1	5735.0	1176.0
415	4		3.0	964.0	3610.9	1184.7
415	4		1.5	822.2	3079.9	2020.9
415	4		2.1	680.5	2548.9	1194.6
415	4		4.0	1190.8	4460.5	1125.7
415	4		3.7	822.2	3079.9	842.1
415	4		3.4	1134.1	4248.1	1267.0
415	4		2.1	964.0	3610.9	1692.4
415	4		1.8	964.0	3610.9	1974.5
415	4		2.1	907.3	3398.5	1592.9
415	4		2.6	1077.4	4035.7	1557.7
415	4		2.1	793.9	2973.7	1393.7
421	4		4.9	170.1	637.2	130.7
421	4		4.0	992.3	3717.1	938.1
421	4		4.0	1134.1	4248.1	1072.1
421	4		2.9	453.6	1699.3	586.8
421	4		3.0	170.1	637.2	209.1
421	4		5.0	822.2	3079.9	612.4
421	4		1.8	992.4	3717.1	2032.5
421	4		4.6	1162.5	4354.3	952.4
421	4		2.4	1077.4	4035.7	1655.1
421	4		3.7	1020.7	3823.3	1045.3
428	4		3.0	1020.7	3823.3	1254.4
428	4		4.0	680.5	2548.9	643.3

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
428	4		4.3	992.4	3717.1	871.1
428	4		4.6	1701.2	6372.2	1393.7
428	4		3.4	1077.4	4035.7	1203.7
428	4		2.4	793.9	2973.7	1219.5
428	4		4.6	964.0	3610.9	789.8
428	4		2.4	737.2	2761.3	1132.4
428	4		5.2	2636.9	9876.9	1906.2
428	4		4.9	567.1	2124.1	435.5
428	4		5.0	850.6	3186.1	633.5
428	4		4.6	964.0	3610.9	789.8
428	4		3.7	1049.1	3929.5	1074.3
428	4		2.6	1020.7	3823.3	1475.7
428	4		4.9	1134.1	4248.1	871.1
428	4		4.1	1219.2	4566.7	1109.8
428	4		2.3	453.6	1699.3	743.3
508	4		4.3	595.4	2230.3	522.7
508	4		3.7	737.2	2761.3	754.9
508	4		4.9	680.5	2548.9	522.7
508	4		4.9	907.3	3398.5	696.9
508	4		3.0	708.8	2655.1	871.1
508	4		4.7	850.6	3186.1	674.4
508	4		2.7	538.7	2017.9	735.6
508	4		4.6	878.9	3292.3	720.1
508	4		3.0	1190.8	4460.5	1463.4
508	4		3.4	850.6	3186.1	950.3
512	4		3.4	.	.	.
512	4		4.0	.	.	.
512	4		2.7	.	.	.
512	4		2.7	.	.	.
512	4		3.0	.	.	.
512	4		2.7	.	.	.
512	4		3.0	.	.	.
512	4		3.0	.	.	.
512	4		2.7	.	.	.
512	4		1.8	.	.	.
512	4		4.6	.	.	.
512	4		4.6	.	.	.
512	4		4.9	.	.	.
512	4		4.9	.	.	.
512	4		4.6	.	.	.
512	4		3.7	.	.	.
512	4		4.6	.	.	.
607	4		4.9	1162.5	4354.3	892.9
607	4		4.6	1531.1	5735.0	1254.4
607	4		2.4	396.9	1486.8	609.8
607	4		4.6	1190.8	4460.5	975.6
607	4		3.0	793.9	2973.7	975.6
607	4		4.0	567.1	2124.1	536.1
607	4		4.9	595.4	2230.3	457.3
607	4		4.3	482.0	1805.5	423.1
607	4		5.2	1616.1	6053.6	1168.3
607	4		4.6	1275.9	4779.2	1045.3
717	4		4.6	793.9	2973.7	650.4

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
717	4		4.3	85.1	318.6	74.7
717	4		2.7	28.4	106.2	38.7
717	4		4.6	396.9	1486.8	325.2
717	4		3.7	198.5	743.4	203.3
717	4		4.3	28.4	106.2	24.9
717	4		2.4	198.5	743.4	304.9
717	4		3.4	170.1	637.2	190.1
717	4		2.4	482.0	1805.5	740.4
717	4		3.7	170.1	637.2	174.2
717	4		4.9	708.8	2655.1	544.4
717	4		2.4	453.6	1699.3	696.9
717	4		5.2	198.5	743.4	143.5
717	4		3.4	623.8	2336.5	696.9
717	4		4.5	623.8	2336.5	511.0
717	4		4.6	396.9	1486.8	325.2
717	4		4.6	1049.1	3929.5	859.5
717	4		3.0	623.8	2336.5	766.6
112		5	4.6	141.8	531.0	116.1
112		5	7.6	368.6	1380.6	181.2
112	5		4.9	992.4	3717.1	762.2
112	5		4.9	1587.8	5947.4	1219.5
112	5		4.6	992.4	3717.1	813.0
112	5		6.4	2098.1	7859.0	1227.8
112	5		5.2	1162.5	4354.3	840.3
112	5		4.9	1077.4	4035.7	827.5
112	5		5.8	1134.1	4248.1	733.5
112	5		4.9	1077.4	4035.7	827.5
112	5		4.9	822.2	3079.9	631.5
112	5		5.2	878.9	3292.3	635.4
112	5		4.9	1389.3	5204.0	1067.1
112	5		5.5	708.8	2655.1	483.9
112	5		4.9	964.0	3610.9	740.4
112	5		5.5	1105.8	4141.9	754.9
112	5		5.2	765.5	2867.5	553.4
112	5		4.6	1190.8	4460.5	975.6
112	5		5.5	1984.7	7434.2	1355.0
112	5		6.1	311.9	1168.2	191.6
120	5		6.1	1247.5	4672.9	766.6
120	5		4.6	964.0	3610.9	789.8
120	5		5.5	737.2	2761.3	503.3
120	5		4.3	1446.0	5416.4	1269.3
120	5		4.7	793.9	2973.7	629.4
120	5		4.9	907.3	3398.5	696.9
120	5		3.0	708.8	2655.1	871.1
120	5		4.6	850.6	3186.1	696.9
120	5		4.9	964.0	3610.9	740.4
120	5		4.3	793.9	2973.7	696.9
123	5		4.3	623.8	2336.5	547.5
123	5		5.5	396.9	1486.8	271.0
123	5		4.6	680.5	2548.9	557.5
123	5		4.9	793.9	2973.7	609.8
123	5		4.3	595.4	2230.3	522.7
123	5		4.9	56.7	212.4	43.6

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
423	5		3.7	510.4	1911.7	522.7
423	5		4.9	396.9	1486.8	304.9
423	5		5.8	1134.1	4248.1	733.5
423	5		5.5	1105.8	4141.9	754.9
426	5		5.2	1020.7	3823.3	737.9
426	5		4.9	538.7	2017.9	413.8
426	5		5.0	964.0	3610.9	718.0
426	5		5.5	1304.2	4885.4	890.4
426	5		5.8	964.0	3610.9	623.5
426	5		5.2	1247.5	4672.9	901.8
426	5		5.3	226.8	849.6	159.3
426	5		4.6	1077.4	4035.7	882.7
426	5		1.2	198.5	743.4	609.8
426	5		5.2	850.6	3186.1	614.9
426	5		5.3	482.0	1805.5	338.5
426	5		3.4	56.7	212.4	63.4
426	5		5.2	793.9	2973.7	573.9
426	5		5.2	623.8	2336.5	450.9
426	5		5.2	453.6	1699.3	327.9
426	5		4.6	0.0	0.0	0.0
426	5		3.7	226.8	849.6	232.3
503	5		6.1	255.2	955.8	156.8
503	5		5.5	652.1	2442.7	445.2
503	5		4.6	283.5	1062.0	232.3
503	5		5.2	1474.4	5522.6	1065.8
503	5		5.5	1162.5	4354.3	793.7
503	5		5.5	623.8	2336.5	425.9
503	5		5.2	595.4	2230.3	430.4
503	5		5.8	1020.7	3823.3	660.2
503	5		5.2	964.0	3610.9	696.9
503	5		4.6	368.6	1380.6	302.0
510		5	9.8	0.0	0.0	0.0
510		5	10.1	0.0	0.0	0.0
510		5	7.6	0.0	0.0	0.0
510	5		5.5	0.0	0.0	0.0
510	5		4.3	0.0	0.0	0.0
510	5		4.3	0.0	0.0	0.0
510	5		5.2	0.0	0.0	0.0
510	5		5.5	0.0	0.0	0.0
510	5		5.5	0.0	0.0	0.0
510	5		5.2	0.0	0.0	0.0
510	5		5.2	0.0	0.0	0.0
510	5		5.5	0.0	0.0	0.0
510	5		5.2	0.0	0.0	0.0
510	5		3.7	0.0	0.0	0.0
510	5		3.7	0.0	0.0	0.0
510	5		5.2	0.0	0.0	0.0
510	5		5.5	0.0	0.0	0.0
607	5		6.1	0.0	0.0	0.0
607	5		5.5	510.4	1911.7	348.4
607	5		4.6	56.7	212.4	46.5
607	5		5.8	680.5	2548.9	440.1
607	5		4.9	482.0	1805.5	370.2

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
607	5		4.9	198.5	743.4	152.4
607	5		5.2	113.4	424.8	82.0
607	5		5.5	0.0	0.0	0.0
607	5		3.7	113.4	424.8	116.1
607	5		4.9	28.4	106.2	21.8
607	5		4.9	56.7	212.4	43.6
607	5		5.5	141.8	531.0	96.8
607	5		7.0	453.6	1699.3	242.4
607	5		4.9	0.0	0.0	0.0
607	5		5.2	56.7	212.4	41.0
607	5		4.6	0.0	0.0	0.0
607	5		4.6	28.4	106.2	23.2
717	5		4.6	255.2	955.8	209.1
717	5		4.6	283.5	1062.0	232.3
717	5		5.2	85.1	318.6	61.5
717	5		3.0	368.6	1380.6	453.0
717	5		5.2	198.5	743.4	143.5
717	5		5.5	652.1	2442.7	445.2
717	5		5.5	453.6	1699.3	309.7
717	5		5.5	907.3	3398.5	619.4
717	5		4.9	255.2	955.8	196.0
717	5		5.2	595.4	2230.3	430.4
717	5		5.2	368.6	1380.6	266.5
717	5		5.5	226.8	849.6	154.9
717	5		5.5	595.4	2230.3	406.5
717	5		5.5	85.1	318.6	58.1
717	5		4.3	311.9	1168.2	273.8
717	5		5.8	652.1	2442.7	421.8
717	5		5.5	538.7	2017.9	367.8
411	6		3.7	907.3	3398.5	929.2
411	6		5.2	1020.7	3823.3	737.9
411	6		4.7	1020.7	3823.3	809.3
411	6		3.4	964.0	3610.9	1077.0
411	6		2.7	737.2	2761.3	1006.6
411	6		5.3	1417.6	5310.2	995.5
411	6		5.8	1616.1	6053.6	1045.3
411	6		5.5	1077.4	4035.7	735.6
411	6		4.9	1162.5	4354.3	892.9
411	6		4.9	907.3	3398.5	696.9
411	6		5.8	1049.1	3929.5	678.5
411	6		5.8	935.6	3504.7	605.2
411	6		5.2	1077.4	4035.7	778.9
411	6		4.7	1077.4	4035.7	854.2
411	6		4.9	1134.1	4248.1	871.1
411	6		5.8	1134.1	4248.1	733.5
420	6		5.8	1020.7	3823.3	660.2
420	6		5.5	964.0	3610.9	658.2
420	6		5.5	1134.1	4248.1	774.3
420	6		5.5	793.9	2973.7	542.0
420	6		4.9	793.9	2973.7	609.8
420	6		4.6	907.3	3398.5	743.3
420	6		5.2	595.4	2230.3	430.4
420	6		5.5	680.5	2548.9	464.6

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
420	6		5.5	737.2	2761.3	503.3
420	6		5.2	793.9	2973.7	573.9
423	6		4.9	822.2	3079.9	631.5
423	6		2.4	340.2	1274.4	522.7
423	6		2.1	198.5	743.4	348.4
423	6		6.4	1133.1	4248.1	663.7
423	6		5.5	1360.9	5097.8	929.2
423	6		4.9	1304.2	4885.4	1001.8
423	6		5.5	1077.4	4035.7	735.6
423	6		5.2	1049.1	3929.5	758.4
423	6		5.5	1134.1	4248.1	774.3
423	6		5.8	907.3	3398.5	586.8
426	6		5.5	1928.0	7221.8	1316.3
426	6		5.5	964.0	3610.9	658.2
426	6		4.0	255.2	955.8	241.2
426	6		6.4	1304.2	4885.4	763.2
426	6		5.8	680.5	2548.9	440.1
426	6		4.9	510.4	1911.7	392.0
426	6		4.3	1077.4	4035.7	945.8
426	6		4.1	170.1	637.2	154.9
426	6		4.6	1275.9	4779.2	1045.3
426	6		5.0	1871.3	7009.4	1393.7
426	6		5.9	1446.0	5416.4	911.3
426	6		5.9	623.8	2336.5	393.1
426	6		6.1	1757.9	6584.6	1080.2
426	6		3.5	340.2	1274.4	363.6
426	6		5.3	1020.7	3823.3	716.8
426	6		4.4	226.8	849.6	192.2
503	6		3.4	255.2	955.8	285.1
503	6		4.6	652.1	2442.7	534.3
503	6		3.0	368.6	1380.6	453.0
503	6		6.1	935.6	3504.7	574.9
503	6		4.9	1162.5	4354.3	892.9
503	6		5.7	935.6	3504.7	676.4
503	6		5.8	255.2	955.8	165.0
503	6		5.2	623.8	2336.5	450.9
503	6		5.5	992.4	3717.1	677.5
503	6		6.1	1559.4	5841.2	958.2
510		6	9.1	0.0	0.0	0.0
510		6	7.3	0.0	0.0	0.0
510		6	8.8	0.0	0.0	0.0
510	6		5.8	0.0	0.0	0.0
510	6		5.8	0.0	0.0	0.0
510	6		4.6	0.0	0.0	0.0
510	6		4.0	0.0	0.0	0.0
510	6		4.9	0.0	0.0	0.0
510	6		4.0	0.0	0.0	0.0
510	6		3.0	0.0	0.0	0.0
510	6		2.7	0.0	0.0	0.0
510	6		5.8	0.0	0.0	0.0
510	6		5.2	0.0	0.0	0.0
510	6		5.5	0.0	0.0	0.0
607	6		4.6	453.6	1699.3	371.7

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
607	6		4.9	368.6	1380.6	283.1
607	6		4.9	85.1	318.6	65.3
607	6		4.9	623.8	2336.5	479.1
607	6		5.8	595.4	2230.3	385.1
607	6		5.8	255.2	955.8	165.0
607	6		6.1	0.0	0.0	0.0
607	6		5.2	368.6	1380.6	266.5
718	6		6.4	1049.1	3929.5	613.9
718	6		5.8	226.8	849.6	146.7
718	6		5.5	170.1	637.2	116.1
718	6		6.1	737.2	2761.3	453.0
718	6		5.8	396.9	1486.8	256.7
718	6		5.2	1162.5	4354.3	840.3
718	6		5.8	652.1	2442.7	421.8
718	6		6.1	453.6	1699.3	278.7
718	6		4.9	311.9	1168.2	239.5
718	6		4.9	1389.3	5204.0	1067.1
718	6		5.5	822.2	3079.9	561.4
718	6		6.1	1049.1	3929.5	644.6
718	6		3.7	652.1	2442.7	667.8
718	6		6.4	1417.6	5310.2	829.6
718	6		6.7	907.3	3398.5	506.8
718	6		4.6	1077.4	4035.7	882.7
718	6		4.9	255.2	955.8	196.0
718	6		5.5	113.4	424.8	77.4
415		7	3.0	680.5	2548.9	836.2
415		7	3.7	1049.1	3929.5	1074.3
415	7		3.0	850.6	3186.1	1045.3
415	7		3.7	1247.5	4672.9	1277.6
415	7		2.7	680.5	2548.9	929.2
415	7		3.4	793.9	2973.7	886.9
415	7		4.3	1134.1	4248.1	995.5
415	7		5.2	1162.5	4354.3	840.3
415	7		4.6	1049.1	3929.5	859.5
415	7		4.7	850.6	3186.1	674.4
415	7		3.0	538.7	2017.9	662.0
415	7		4.9	1417.6	5310.2	1088.9
415	7		2.4	1077.4	4035.7	1655.1
415	7		3.7	1049.1	3929.5	1074.3
419	7		4.0	510.4	1911.7	482.5
419	7		3.0	680.5	2548.9	836.2
419	7		4.9	1105.8	4141.9	849.3
419	7		4.9	1134.1	4248.1	871.1
419	7		3.7	708.8	2655.1	725.9
419	7		4.3	482.0	1805.5	423.1
419	7		3.0	510.4	1911.7	627.2
419	7		3.4	396.9	1486.8	443.5
419	7		2.7	453.6	1699.3	619.4
419	7		4.7	878.9	3292.3	696.9
422	7		2.4	1304.2	4885.4	2003.5
422	7		4.3	964.0	3610.9	846.2
422	7		5.2	850.6	3186.1	614.9
422	7		4.6	1219.2	4566.7	998.9

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
422	7		4.6	737.2	2761.3	604.0
422	7		4.0	623.8	2336.5	589.7
422	7		3.4	907.3	3399.5	1013.6
422	7		3.0	1360.9	5097.8	1672.5
422	7		2.7	340.2	1274.4	464.6
422	7		2.7	567.1	2124.1	774.3
425	7		3.0	935.6	3504.7	1149.8
425	7		3.4	680.5	2548.9	760.2
425	7		4.0	1360.9	5097.8	1286.5
425	7		4.3	1105.8	4141.9	970.6
425	7		3.7	964.0	3610.9	987.2
425	7		3.0	680.5	2548.9	836.2
425	7		2.4	1360.9	5097.8	2090.6
425	7		2.4	793.9	2973.7	1219.5
425	7		3.0	935.6	3504.7	1149.8
425	7		4.9	1984.7	7434.2	1524.4
425	7		6.1	737.2	2761.3	453.0
425	7		5.5	1701.2	6372.2	1161.5
425	7		4.9	1360.9	5097.8	1045.3
425	7		4.6	1105.8	4141.9	905.9
425	7		3.5	765.5	2867.5	818.1
425	7		3.0	510.4	1911.7	627.2
425	7		2.7	1049.1	3929.5	1432.5
425	7		3.4	1077.4	4035.7	1203.7
509		7	4.3	567.1	2124.1	497.8
509		7	3.4	453.6	1699.3	506.8
509	7		3.4	737.2	2761.3	823.6
509	7		4.6	510.4	1911.7	418.1
509	7		3.7	567.1	2124.1	580.7
509	7		3.7	850.6	3186.1	871.1
509	7		2.1	510.4	1911.7	896.0
509	7		4.0	623.8	2336.5	589.7
509	7		4.6	737.2	2761.3	604.0
509	7		4.3	396.9	1486.8	348.4
509	7		5.5	964.0	3610.9	658.2
509	7		6.1	623.8	2336.5	383.3
607	7		3.4	113.4	424.8	126.7
607	7		3.7	85.1	318.6	87.1
607	7		2.7	623.8	2336.5	851.7
607	7		4.3	170.1	637.2	149.3
607	7		3.7	0.0	0.0	0.0
607	7		3.4	482.0	1805.5	538.5
607	7		5.2	283.5	1062.0	205.0
607	7		4.6	850.6	3186.1	696.9
607	7		3.4	141.8	531.0	158.4
607	7		4.6	113.4	424.8	92.9
607	7		3.7	56.7	212.4	58.1
607	7		5.2	340.2	1274.4	246.0
607	7		4.9	1020.7	3823.3	784.0
607	7		4.3	141.8	531.0	124.4
607	7		3.0	283.5	1062.0	348.4
607	7		5.2	170.1	637.2	123.0
607	7		4.0	680.5	2548.9	643.3

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
607	7		5.5	1020.7	3823.3	696.9
718	7		4.0	340.2	1274.4	321.6
718	7		3.4	368.6	1380.6	411.8
718	7		3.4	0.0	0.0	0.0
718	7		4.3	28.4	106.2	24.9
718	7		4.0	0.0	0.0	0.0
718	7		4.6	28.4	106.2	23.2
718	7		3.0	0.0	0.0	0.0
718	7		6.1	255.2	955.8	156.8
718	7		4.6	28.4	106.2	23.2
718	7		3.7	56.7	212.4	58.1
718	7		3.0	56.7	212.4	69.7
718	7		5.8	198.5	743.4	128.4
718	7		5.2	311.9	1168.2	225.5
718	7		4.3	0.0	0.0	0.0
718	7		3.7	0.0	0.0	0.0
718	7		4.0	226.8	849.6	214.4
718	7		3.4	0.0	0.0	0.0
718	7		3.4	340.2	1274.4	380.1
416		8	5.5	1389.3	5204.0	948.5
416		8	5.5	850.6	3186.1	580.7
416		8	6.1	1105.8	4141.9	679.5
416	8		2.1	567.1	2124.1	995.5
416	8		2.1	793.9	2973.7	1393.7
416	8		2.7	396.9	1486.8	542.0
416	8		2.4	1134.1	4248.1	1742.2
416	8		2.7	765.5	2867.5	1045.3
416	8		4.6	1134.1	4248.1	929.2
416	8		2.1	793.9	2973.7	1393.7
416	8		2.4	935.6	3504.7	1437.3
416	8		2.7	850.6	3186.1	1161.5
416	8		2.1	283.5	1062.0	497.8
416	8		3.0	765.5	2867.5	940.8
416	8		5.2	1134.1	4248.1	819.8
416	8		2.7	992.4	3717.1	1355.0
416	8		4.0	1077.4	4035.7	1018.5
416	8		4.6	907.3	3398.5	743.3
416	8		2.7	765.5	2867.5	1045.3
423	8		5.5	850.6	3186.1	580.7
423	8		2.1	850.6	3186.1	1493.3
423	8		2.4	680.5	2548.9	1045.3
423	8		5.2	708.8	2655.1	512.4
423	8		2.4	652.1	2442.7	1001.8
423	8		3.0	765.5	2867.5	940.8
423	8		3.0	907.3	3398.5	1115.0
423	8		3.0	567.1	2124.1	696.9
423	8		5.5	1105.8	4141.9	754.9
423	8		2.7	1304.2	4885.4	1790.9
426	8		4.9	1190.8	4460.5	914.6
426	8		2.6	623.8	2336.5	901.8
426	8		2.4	1020.7	3823.3	1568.0
426	8		2.4	737.2	2761.3	1132.4
426	8		2.7	1134.1	4248.1	1548.6

DATE	TREATMENT	BUFFER	DEPTH METERS	YIELD/GRAMS	YIELD/GRAMS SQUARE METER	YIELD/GRAMS CUBIC METER
426	B		2.7	1077.4	4035.7	1471.2
426	B		3.5	907.3	3398.5	969.6
426	B		5.9	1587.8	5947.4	1000.6
426	B		2.6	623.8	2336.5	901.8
426	B		3.4	567.1	2124.1	633.5
508	B		2.4	822.2	3079.9	1263.1
508	B		3.0	907.3	3398.5	1115.0
508	B		4.9	1190.8	4460.5	914.6
508	B		2.7	765.5	2867.5	1045.3
508	B		2.4	510.4	1911.7	784.0
508	B		3.4	680.5	2548.9	760.2
508	B		4.0	1077.4	4035.7	1018.5
508	B		2.7	680.5	2548.9	929.2
508	B		5.2	1162.5	4354.3	840.3
508	B		2.1	737.2	2761.3	1294.2
514	B		4.9	425.3	1593.1	326.7
514	B		5.5	453.6	1699.3	309.7
514	B		3.4	510.4	1911.7	570.2
514	B		3.4	822.2	3079.9	918.6
514	B		3.7	964.0	3610.9	987.2
514	B		3.7	170.1	637.2	174.2
514	B		3.4	1049.1	3929.5	1172.0
514	B		6.1	793.9	2973.7	487.8
514	B		4.0	1219.2	4566.7	1152.5
514	B		2.1	1360.9	5097.8	2389.3
514	B		2.1	538.7	2017.9	945.8
514	B		2.7	708.8	2655.1	967.9
514	B		2.7	623.8	2336.5	851.7
514	B		2.7	1162.5	4354.3	1587.3
514	B		3.4	850.6	3186.1	950.3
607	B		3.0	708.8	2655.1	871.1
607	B		2.1	283.5	1062.0	497.8
607	B		2.7	765.5	2867.5	1045.3
607	B		3.0	850.6	3186.1	1045.3
607	B		3.4	935.6	3504.7	1045.3
718	B		5.5	1786.2	6690.8	1219.5
718	B		5.5	907.3	3398.5	619.4
718	B		3.7	793.9	2973.7	813.0
718	B		4.3	1360.9	5097.8	1194.6
718	B		1.6	850.6	3186.1	696.9
718	B		2.7	765.5	2867.5	1045.3
718	B		2.7	652.1	2442.7	890.4
718	B		3.4	1134.1	4248.1	1267.0
718	B		3.0	453.6	1699.3	557.5
718	B		3.0	1162.5	4354.3	1428.6
718	B		2.7	453.6	1699.3	619.4
718	B		4.0	652.1	2442.7	616.5
718	B		4.0	680.5	2548.9	643.3
718	B		5.8	907.3	3398.5	586.0
718	B		6.4	1644.5	6159.8	962.3

APPENDIX C: ENDOTHALL RESIDUE--WATER, SEDIMENT, AND PLANTS

KEY

Symbol	Explanation
WATER TOP	0.3 m below water surface (ppm a.e.)
WATER MIDDLE	2.0 m below water surface (ppm a.e.)
WATER BOTTOM	0.5 m above sediment (ppm a.e.)
SOIL	Sediment (ppm a.e.)
WEEDS	Hydrilla (ppm a.e.)

DATE	WATER TREATMENT	WATER BUFFER	WATER TOP	WATER MIDDLE	WATER BOTTOM	SOIL TREATMENT	SOIL BUFFER	SOIL PPM	WEEDS TREATMENT	WEED PPM
412	1		0.00	0.00	0.00	1		0.00	1	0.00
420	1		0.12	0.28	0.09	1		0.49	1	0.61
420	1		0.11	0.38	1.36	1		0.00	1	0.58
420	1		0.19	0.18	0.00	1		0.00	1	0.53
420		1	.	0.25	0.07			.	1	0.16
420		1	.	0.14	0.00			.	1	0.00
420		1	.	0.95	0.11	1		1.06	1	0.39
423			.	.	.			.	1	0.67
423			.	.	.			.	1	0.48
423			.	.	.	1		0.22	1	0.43
423	1		0.34	0.23	0.23	1		0.16	1	0.73
423	1		0.11	0.12	.	1		0.75	1	0.67
423	1		0.17	0.22	0.24	1		0.00	1	0.57
426			.	.	.	1		0.00	1	0.32
426			.	.	.	1		0.00	1	0.36
426	1		0.00	0.01	0.00	1		0.00	1	0.46
426		1	.	0.10	0.02	1		0.00	1	0.35
426		1	.	0.08	0.12		1	0.00	1	0.23
426		1	.	0.00	0.00		1	0.00	1	0.24
503			.	.	.			.	1	0.30
503			.	.	.			.	1	0.38
503			.	.	.			.	1	0.24
503		1	.	0.00	0.00			.	1	0.27
503		1	.	0.00	0.00			.	1	0.33
503		1	.	0.00	0.00			.	1	0.44
510			.	.	.			.	1	0.20
510			.	.	.			.	1	0.20
510			.	.	.			.	1	0.07
510			.	.	.			.	1	0.24
510			.	.	.			.	1	0.23
510			.	.	.			.	1	0.14
419	2		0.00	0.00	0.00	2		0.00	2	0.00
419	2		0.08	0.12	0.18	2		0.16	2	0.21
419	2		0.02	0.02	0.09	2		2.00	2	0.00
419	2		0.01	0.02	0.10	2		1.80	2	.
419		2	.	0.04	0.13			.	2	.
419		2	.	0.00	0.07			.	2	.
419		2	.	0.05	0.04	2		0.14	2	.
421			.	.	.	2		3.00	2	.
421	2		0.15	0.12	0.18	2		0.21	2	0.23
421	2		0.18	0.13	0.14	2		0.14	2	0.09
421	2		0.06	0.06	0.02	2		3.30	2	.
425	2		0.09	0.12	0.09	2		2.30	2	0.41
425	2		0.07	0.14	0.14	2		0.09	2	0.25
425	2		0.09	0.15	0.12	2		0.14	2	1.06
425		2	.	0.10	0.09			.	2	0.28
425		2	.	0.00	0.00			.	2	0.24
425		2	.	0.12	0.13	2		7.10	2	0.28
502	2		0.00	0.00	0.00	2		0.05	2	0.12
502	2		0.00	0.00	0.00	2		0.06	2	0.28
502	2		0.00	0.00	0.00	2		1.90	2	0.30
502		2	.	0.00	0.04			.	2	0.26
502		2	.	0.00	0.00			.	2	0.23
502		2	.	0.00	0.00	2		1.10	2	0.13

DATE	WATER TREATMENT	WATER BUFFER	WATER TOP	WATER MIDDLE	WATER BOTTOM	SOIL TREATMENT	SOIL BUFFER	SOIL PPM	WEEDS TREATMENT	WEED PPM
509			.	.	.			.	2	0.10
509			.	.	.			.	2	0.58
509			.	.	.	2		3.70	2	0.05
509	2		.	.	0.00	2		1.80	2	0.00
509	2		.	.	0.00	2		0.39	2	0.34
509	2		.	.	0.00	2		5.30	2	0.49
414	3		0.00	0.00	0.00	3		0.00	3	0.00
419	3		0.02	0.02	0.10	3		1.00	3	0.22
419	3		0.05	0.06	.	3		0.17	3	0.05
419	3		0.09	0.12	.	3		.	3	.
419		3	.	0.08	.			.	3	.
419		3	.	0.04	.			.	3	.
419		3	.	0.17	.			.	3	.
419		3	.	0.17	.	3		0.54	3	.
421			.	.	.	3		3.80	3	.
421	3		0.10	0.09	0.14	3		0.24	3	0.23
421	3		0.10	0.09	0.13	3		0.40	3	0.29
421	3		0.09	0.13	0.06	3		0.34	3	.
425			.	.	.		3	0.00	3	0.14
425			.	.	.		3	0.00	3	.
425			.	.	.		3	0.00	3	.
425	3		0.01	0.00	0.05	3		2.00	3	0.18
425		3	.	0.00	.	3		2.40	3	0.21
425		3	.	0.00	.	3		0.30	3	0.15
425		3	.	0.00	.	3		0.30	3	0.18
425		3	.	0.00	.		3	0.00	3	0.07
502			.	.	.			.	3	1.20
502			.	.	.			.	3	0.16
502			.	.	.			.	3	0.26
502	3		.	.	0.01	3		0.04	3	0.21
502	3		.	0.00	.	3		3.40	3	0.26
502	3		.	.	0.04	3		0.06	3	0.34
509			.	.	.			.	3	0.24
509			.	.	.			.	3	0.17
509			.	.	.	3		0.75	3	0.18
509	3		.	.	0.00	3		3.10	3	0.10
509	3		.	.	0.01	3		0.22	3	0.12
509	3		.	.	0.00	3		0.90	3	0.00
414	4		0.00	0.00	0.00			.	4	0.00
421	4		0.10	0.10	0.01	4		0.00	4	0.05
421	4		0.00	0.03	0.00	4		0.00	4	0.08
421		4	.	0.00	.	4		0.00	4	.
421		4	.	0.08	.	4		0.00	4	.
425	4		0.00	.	.			.	4	.
425	4		0.00	0.00	0.00	4		0.00	4	0.00
425	4		0.00	0.00	.	4		0.00	4	0.13
425		4	.	0.00	0.00			.	4	.
425		4	.	0.00	0.00			.	4	.
428			.	.	.			.	4	0.10
428			.	.	.			.	4	0.00
508			.	.	.			.	4	0.00
508			.	.	.			.	4	0.08
512			.	.	.			.	4	0.00
512			.	.	.			.	4	.

DATE	WATER TREATMENT	WATER BUFFER	WATER TOP	WATER MIDDLE	WATER BOTTOM	SOIL TREATMENT	SOIL BUFFER	SOIL PPM	WEEDS TREATMENT	WEED PPM
412	5		0.00	0.00	0.00	5		0.00	5	0.00
420	5		0.62	0.44	0.24	5		0.00	5	0.34
420	5		0.30	0.42	0.14	5		1.32	5	0.26
420	5		1.08	1.26	0.10	5		0.41	5	1.03
420		5	.	0.05	.			.	5	0.19
420		5	.	0.03	.			.	5	0.33
420		5	.	0.18	.	5		0.92	5	0.31
423	5		0.07	0.03	0.04	5		0.22	5	0.31
423	5		0.04	0.03	0.02	5		0.20	5	0.29
423	5		0.02	0.10	0.11	5		0.00	5	0.55
423		5	.	0.07	.			.	5	0.29
423		5	.	0.06	.			.	5	0.40
423		5	.	0.07	.	5		0.11	5	0.33
426	5		0.00	0.00	0.00	5		0.00	5	0.22
426	5		0.00	0.00	0.01	5		0.00	5	0.22
426	5		0.01	0.00	0.00	5		0.00	5	0.23
426		5	.	0.00	0.00	5		0.00	5	0.33
426		5	.	0.00	0.00		5	0.00	5	0.35
426		5	.	0.00	0.00		5	0.00	5	0.25
503			.	.	.			.	5	0.12
503			.	.	.			.	5	0.15
503			.	.	.			.	5	0.19
503			.	.	.			.	5	0.14
503			.	.	.			.	5	0.14
503			.	.	.			.	5	0.14
510			.	.	.			.	5	0.13
510			.	.	.			.	5	0.11
510			.	.	.			.	5	0.12
510			.	.	.			.	5	0.13
510			.	.	.			.	5	0.09
510			.	.	.			.	5	0.09
411	6		0.00	0.00	0.00	6		0.00	6	0.00
420	6		0.42	0.00	0.36	6		0.00	6	0.14
420	6		0.38	0.30	0.00	6		0.07	6	0.23
420	6		0.31	0.52	0.91	6		0.00	6	0.32
420		6	.	0.18	.			.	6	0.25
420		6	.	0.09	.			.	6	0.34
420		6	.	0.27	.	6		0.44	6	0.49
423	6		0.03	0.02	0.02	6		0.00	6	0.20
423	6		0.05	0.05	0.08	6		0.00	6	0.17
423	6		0.04	.	.	6		0.00	6	0.12
423		6	.	0.06	.			.	6	0.11
423		6	.	0.03	.			.	6	0.43
423		6	.	0.05	.	6		0.00	6	0.14
426			.	.	.		6	0.00	6	0.14
426			.	.	.		6	0.00	6	0.23
426	6		0.00	0.00	0.00	6		0.00	6	0.25
426		6	.	0.00	0.00	6		0.00	6	0.33
426		6	.	0.00	0.00	6		0.00	6	0.15
426		6	.	0.00	0.00	6		0.00	6	0.16
503			.	.	.			.	6	0.12
503			.	.	.			.	6	0.11
503			.	.	.			.	6	0.14
503			.	.	.			.	6	0.18

DATE	WATER TREATMENT	WATER BUFFER	WATER TOP	WATER MIDDLE	WATER BOTTOM	SOIL TREATMENT	SOIL BUFFER	SOIL PPM	WEEDS TREATMENT	WEED PPM
503			.	.	.			.	6	0.24
503			.	.	.			.	6	0.17
510			.	.	.			.	6	0.10
510			.	.	.			.	6	0.00
510			.	.	.			.	6	0.00
510			.	.	.			.	6	0.00
510			.	.	.			.	6	0.14
510			.	.	.			.	6	0.00
415	7		0.00	0.00	0.00	7		0.00	7	0.00
419	7		0.10	0.10	0.25	7		.	7	0.28
419	7		0.10	0.13	.	7		2.80	7	0.36
419	7		0.04	0.16	.	7		5.80	7	.
419		7	.	0.00	.			.	7	.
419		7	.	0.05	.	7		0.66	7	.
421			.	.	.	7		.	7	.
421	7		0.04	0.03	0.13	7		1.80	7	0.09
421	7		0.12	0.12	0.02	7		1.90	7	0.32
421	7		0.09	0.14	.	7		3.80	7	.
425			.	.	.		7	0.00	7	0.39
425	7		0.01	0.01	0.38	7		0.08	7	1.53
425	7		0.00	0.00	0.03	7		3.60	7	0.59
425	7		0.04	0.20	.	7		5.30	7	0.26
425		7	.	0.00	0.00	7		0.09	7	0.00
425		7	.	0.00	0.00		7	0.00	7	0.18
502			.	.	.			.	7	0.28
502			.	.	.			.	7	0.07
502			.	.	.	7		5.60	7	0.45
502	7		.	.	0.01	7		1.60	7	0.29
502	7		.	0.00	.	7		3.60	7	0.14
502	7		.	.	0.04	7		0.76	7	0.81
509			.	.	.			.	7	0.06
509			.	.	.			.	7	0.00
509			.	.	.	7		0.69	7	0.24
509	7		.	.	0.04	7		3.10	7	0.15
509	7		.	.	0.00	7		0.54	7	0.64
509	7		.	.	0.01	7		0.37	7	0.24
415	8		0.00	0.00	0.00			.	8	0.00
422			.	.	.	8		0.00	8	.
422			.	.	.	8		0.00	8	.
422			.	.	.	8		0.00	8	.
422			.	.	.	8		0.00	8	.
422	8		0.02	.	.			.	8	0.00
422	8		0.00	0.00	.			.	8	0.00
422	8		0.01	0.00	0.00			.	8	.
426	8		0.00	0.00	0.03	8		0.00	8	0.00
426	8		0.00	0.00	.	8		0.00	8	0.00
501			.	.	.			.	8	0.00
501			.	.	.			.	8	0.00
508			.	.	.			.	8	0.00
508			.	.	.			.	8	0.00
512			.	.	.			.	8	0.00
512			.	.	.			.	8	0.00

APPENDIX D: WATER QUALITY DATA

KEY

Symbol	Explanation
DEPTH	metres
TEMP	°C
COND	μmhos/cm
DO	ppm
PH	--
TURBID	Jackson Turbidity Units
BOD5	ppm
NH3-N	Ammonia-nitrogen, ppm
TOT-P	Total phosphate, ppm
HARD	Total hardness, ppm as $CA(CO_3)_2$
ALK	Total alkalinity, ppm as $CA(CO_3)_2$
COLOR	Colorimetric units

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
412		1	0.3	29.60	123.00	9.28	9.10	0.580	0.100	0.039	0.10	0.010	42.00	51.00	15.00
412		1	1.0	28.90	126.00	7.58	8.55	.	.	.	.	.	.	.	.
412		1	2.0	28.60	127.00	5.11	8.14	0.670	0.650	0.039	0.10	0.010	42.00	50.00	20.00
412		1	3.4	28.10	128.00	2.58	7.54	.	.	.	.	.	.	.	.
412		1	0.3	29.40	128.00	7.18	8.56	0.680	.	0.027	0.10	0.010	42.00	50.00	10.00
412		1	1.0	29.20	129.00	7.09	8.53	.	.	.	.	.	.	.	.
412		1	2.0	28.70	129.00	3.92	7.61	0.510	0.050	0.041	0.10	0.010	43.00	51.00	10.00
412		1	6.6	28.10	130.00	1.13	7.38	0.780	0.050	0.033	0.10	0.010	43.00	53.00	10.00
412		1	0.3	30.50	128.00	8.41	8.82	2.200	0.650	0.030	0.10	0.015	39.00	53.00	20.00
412		1	1.0	29.50	130.00	6.51	8.08	.	.	.	.	.	.	.	.
412		1	2.0	28.90	128.00	3.38	7.47	1.900	0.250	0.025	0.10	0.013	42.00	49.00	10.00
412		1	4.7	28.40	127.00	0.50	7.30	2.400	0.100	0.070	0.10	0.016	42.00	49.00	20.00
412	1		0.3	30.60	129.00	8.94	9.12	0.620	0.300	0.037	0.10	0.011	39.00	51.00	10.00
412	1		1.0	30.00	129.00	7.11	8.47	.	.	.	.	.	.	.	.
412	1		2.0	28.80	129.00	4.07	7.65	0.680	0.350	0.050	0.10	0.010	40.00	51.00	10.00
412	1		2.4	28.50	129.00	2.72	7.51	1.600	0.700	0.059	0.11	0.011	41.00	50.00	10.00
412	1		0.3	29.60	127.00	9.67	9.15	0.590	0.200	0.035	0.10	0.010	37.00	52.00	15.00
412	1		1.0	28.80	128.00	7.29	8.45	.	.	.	.	.	.	.	.
412	1		2.0	28.40	128.00	6.31	8.21	0.380	0.300	0.034	0.10	0.013	40.00	51.00	10.00
412	1		3.5	28.10	130.00	4.29	7.68	2.000	0.050	0.070	0.10	0.011	41.00	50.00	15.00
412	1		0.3	30.70	126.00	9.17	9.13	1.200	0.250	0.027	0.10	0.011	43.00	51.00	15.00
412	1		1.0	29.20	127.00	4.35	7.62	.	.	.	.	.	.	.	.
412	1		2.0	28.40	128.00	3.51	7.59	1.100	0.050	0.048	0.12	0.010	39.00	42.00	10.00
412	1		3.6	28.20	131.00	0.25	7.25	1.900	0.350	0.120	0.17	0.018	43.00	52.00	10.00
420	1		0.3	32.50	130.00	7.08	8.24	.	.	.	.	.	.	.	.
420	1		1.0	29.40	128.00	5.70	7.68	.	.	.	.	.	.	.	.
420	1		2.0	29.20	128.00	4.50	7.47	.	.	.	.	.	.	.	.
420	1		3.6	28.90	128.00	0.62	6.90	.	.	.	.	.	.	.	.
420	1		0.3	30.00	126.00	7.61	8.32	.	.	.	.	.	.	.	.
420	1		1.0	29.50	128.00	7.20	8.28	.	.	.	.	.	.	.	.
420	1		2.0	29.20	129.00	7.07	8.25	.	.	.	.	.	.	.	.
420	1		4.1	28.90	130.00	2.99	7.27	.	.	.	.	.	.	.	.
420	1		0.3	29.90	129.00	8.05	8.48	.	.	.	.	.	.	.	.
420	1		1.0	29.50	130.00	7.49	8.30	.	.	.	.	.	.	.	.
420	1		2.0	29.20	132.00	6.64	8.15	.	.	.	.	.	.	.	.
420	1		3.2	29.00	134.00	2.31	7.20	.	.	.	.	.	.	.	.
423		1	0.3	29.80	127.00	5.05	7.03	.	.	.	.	.	.	.	.
423		1	1.0	29.60	127.00	4.73	7.23	.	.	.	.	.	.	.	.
423		1	2.0	29.00	125.00	3.05	7.00	.	.	.	.	.	.	.	.
423		1	3.2	28.40	126.00	1.27	6.84	.	.	.	.	.	.	.	.
423		1	0.3	29.70	127.00	4.88	7.26	.	.	.	.	.	.	.	.
423		1	1.0	29.50	127.00	4.86	7.26	.	.	.	.	.	.	.	.
423		1	2.0	29.00	126.00	3.85	7.31	.	.	.	.	.	.	.	.
423		1	6.3	28.60	127.00	2.51	7.03	.	.	.	.	.	.	.	.
423		1	0.3	32.30	124.00	7.80	7.87	.	.	.	.	.	.	.	.
423		1	1.0	29.50	126.00	6.92	7.37	.	.	.	.	.	.	.	.
423		1	2.0	29.00	128.00	6.86	7.16	.	.	.	.	.	.	.	.
423		1	4.8	28.70	128.00	3.01	7.11	.	.	.	.	.	.	.	.
423	1		0.3	30.10	127.00	6.13	7.52	.	.	.	.	.	.	.	.
423	1		1.0	29.10	127.00	4.73	7.25	.	.	.	.	.	.	.	.
423	1		2.0	28.70	126.00	3.22	6.98	.	.	.	.	.	.	.	.
423	1		0.3	29.60	130.00	4.51	7.27	.	.	.	.	.	.	.	.
423	1		1.0	29.20	129.00	3.94	7.19	.	.	.	.	.	.	.	.
423	1		2.0	28.70	128.00	2.81	7.01	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
423	1		3.5	28.60	129.00	2.82	7.06	.	.	.	.	.	.	.	.
423	1		0.3	29.50	128.00	4.75	7.24	.	.	.	.	.	.	.	.
423	1		1.0	29.10	127.00	4.05	7.18	.	.	.	.	.	.	.	.
423	1		2.0	28.80	128.00	4.05	7.19	.	.	.	.	.	.	.	.
423	1		2.6	28.70	128.00	4.12	7.22	.	.	.	.	.	.	.	.
426		1	0.3	29.90	125.00	5.38	7.40	0.860	0.900	0.015	0.10	0.010	38.00	53.00	10.00
426		1	1.0	29.80	125.00	5.36	7.41	.	.	.	.	.	.	.	.
426		1	2.0	29.70	125.00	4.83	7.25	0.720	0.800	0.015	0.10	0.010	40.00	52.00	15.00
426		1	3.3	28.80	124.00	0.17	6.66	6.900	1.680	0.080	0.14	0.012	41.00	53.00	50.00
426		1	0.3	29.90	125.00	6.11	7.68	0.610	0.450	0.010	0.13	0.010	38.00	52.00	15.00
426		1	1.0	29.90	127.00	6.05	7.69	.	.	.	.	.	.	.	.
426		1	2.0	29.70	126.00	6.31	7.81	0.480	0.350	0.015	0.10	0.010	39.00	52.00	10.00
426		1	5.9	28.70	137.00	0.07	6.63	2.500	2.920	0.120	0.24	0.016	41.00	53.00	40.00
426		1	0.3	30.10	126.00	7.67	8.30	0.750	0.540	0.040	0.10	0.010	40.00	50.00	15.00
426		1	1.0	30.00	126.00	6.88	8.02	.	.	.	.	.	.	.	.
426		1	2.0	29.70	127.00	4.37	7.31	0.980	0.200	0.020	0.10	0.010	40.00	53.00	10.00
426		1	4.6	29.00	127.00	0.14	6.78	16.000	0.900	0.070	0.12	0.013	41.00	53.00	70.00
426	1		0.3	29.80	125.00	5.98	7.65	0.750	1.150	0.060	0.10	0.010	39.00	52.00	10.00
426	1		1.0	29.80	125.00	5.82	7.58	.	.	.	.	.	.	.	.
426	1		2.0	29.70	126.00	4.70	7.28	0.600	0.900	0.060	0.10	0.010	39.00	53.00	10.00
426	1		3.2	29.40	134.00	1.39	6.91	7.900	5.470	0.100	0.14	0.013	41.00	50.00	70.00
426	1		0.3	29.60	125.00	5.70	7.53	0.580	0.550	0.040	0.10	0.010	38.00	53.00	10.00
426	1		1.0	29.60	125.00	6.20	7.68	.	.	.	.	.	.	.	.
426	1		2.0	29.60	126.00	5.17	7.38	0.650	0.950	0.040	0.10	0.010	43.00	52.00	10.00
426	1		3.1	29.40	127.00	2.81	7.08	0.450	1.450	0.040	0.10	0.010	39.00	51.00	10.00
426	1		0.3	29.80	126.00	1.92	7.34	0.530	1.200	0.080	0.10	0.010	38.00	54.00	10.00
426	1		1.0	29.70	125.00	5.70	7.50	.	.	.	.	.	.	.	.
426	1		2.0	29.60	126.00	5.04	7.34	0.450	1.070	0.040	0.10	0.010	40.00	53.00	10.00
426	1		4.5	29.00	142.00	0.14	6.77	4.500	4.850	0.050	0.12	0.023	42.00	53.00	50.00
503		1	0.3	31.20	128.00	5.69	7.36	0.330	0.620	0.010	0.10	0.022	43.00	43.00	15.00
503		1	1.0	30.60	128.00	5.32	7.32	.	.	.	.	.	.	.	.
503		1	2.0	30.50	128.00	5.32	7.33	1.700	0.450	0.010	0.10	0.017	43.00	44.00	10.00
503		1	3.6	29.60	123.00	0.30	6.64	8.100	3.970	0.150	0.18	0.044	41.00	38.00	70.00
503		1	0.3	31.70	127.00	6.49	7.66	0.510	1.390	0.010	0.10	0.016	42.00	41.00	10.00
503		1	2.0	.	.	.	.	0.580	0.870	0.010	0.10	0.095	44.00	40.00	15.00
503		1	9.9	.	.	.	.	1.400	0.780	0.020	0.10	0.010	44.00	38.00	20.00
503		1	0.3	31.40	129.00	6.65	7.76	0.380	0.980	0.010	0.10	0.017	43.00	40.00	10.00
503		1	1.0	31.30	129.00	6.52	7.77	.	.	.	.	.	.	.	.
503		1	2.0	30.80	129.00	6.67	8.00	0.670	1.510	0.010	0.10	0.015	42.00	41.00	10.00
503		1	4.9	29.60	125.00	0.31	6.81	5.500	9.990	0.130	0.15	0.039	43.00	42.00	40.00
503	1		0.3	30.40	132.00	5.08	7.36	0.330	0.700	0.010	0.10	0.023	42.00	42.00	15.00
503	1		1.0	30.30	132.00	4.93	7.33	.	.	.	.	.	.	.	.
503	1		2.0	30.20	132.00	5.18	7.40	0.290	0.970	0.010	0.10	0.011	44.00	40.00	15.00
503	1		3.9	29.70	148.00	0.10	6.67	1.300	2.350	0.030	0.12	0.020	44.00	41.00	10.00
503	1		0.3	30.10	141.00	5.38	7.24	0.450	1.100	0.020	0.10	0.029	43.00	42.00	15.00
503	1		1.0	30.20	139.00	5.29	7.24	.	.	.	.	.	.	.	.
503	1		2.0	30.20	138.00	4.93	7.20	0.330	0.820	0.010	0.12	0.031	43.00	41.00	15.00
503	1		4.5	29.60	134.00	0.09	6.53	1.700	3.070	0.030	0.12	0.022	41.00	39.00	25.00
503	1		0.3	30.30	133.00	5.05	7.27	0.290	0.950	0.010	0.11	0.010	42.00	42.00	10.00
503	1		1.0	30.30	133.00	5.40	7.35	.	.	.	.	.	.	.	.
503	1		2.0	30.20	133.00	5.58	7.41	0.360	0.800	0.010	0.10	0.011	43.00	39.00	12.00
503	1		4.1	29.80	137.00	0.11	6.60	3.200	0.370	0.120	0.11	0.065	44.00	42.00	40.00
505		1	1.0	30.90	128.00	6.00	7.59	.	.	.	.	.	.	.	.
505		1	2.0	30.50	128.00	6.04	7.65	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
505		1	5.2	29.20	141.00	0.10	6.59	.	.	.	.	.	.	.	.
510		1	0.3	30.60	131.00	4.46	6.92	0.440	0.700	0.068	0.12	0.012	.	.	10.00
510		1	1.0	30.50	131.00	4.18	6.93	.	.	.	.	.	.	.	.
510		1	2.0	30.40	131.00	4.36	6.83	0.420	0.750	0.046	0.10	0.012	.	.	10.00
510		1	3.8	29.40	141.00	0.13	6.38	3.400	2.400	0.190	0.30	0.035	.	.	60.00
510		1	0.3	30.60	126.00	4.85	7.10	0.310	0.500	0.030	0.10	0.011	.	.	5.00
510		1	1.0	30.60	130.00	4.94	7.11	.	.	.	.	.	.	.	.
510		1	2.0	30.50	130.00	4.07	6.95	0.340	0.830	0.043	0.14	0.012	.	.	15.00
510		1	6.0	29.70	145.00	0.09	6.36	1.600	4.470	0.270	0.32	0.024	.	.	40.00
510		1	0.3	31.00	126.00	6.47	7.67	0.620	2.850	0.023	0.10	0.014	.	.	15.00
510		1	1.0	30.80	130.00	6.38	7.60	.	.	.	.	.	.	.	.
510		1	2.0	30.60	131.00	5.37	7.30	0.430	1.170	0.050	0.10	0.019	.	.	10.00
510		1	4.7	30.10	130.00	0.57	6.59	1.600	1.750	0.047	0.10	0.012	.	.	20.00
510	1		0.3	30.00	130.00	4.77	7.05	0.390	0.750	0.060	0.10	0.011	.	.	10.00
510	1		1.0	30.50	131.00	4.76	7.05	.	.	.	.	.	.	.	.
510	1		2.0	30.40	131.00	4.12	6.93	0.430	0.700	0.070	0.10	0.013	.	.	15.00
510	1		4.7	30.30	131.00	3.56	6.83	3.400	3.420	0.084	0.15	0.044	.	.	60.00
510	1		0.3	30.40	133.00	4.27	6.88	0.390	0.280	0.050	0.10	0.013	.	.	10.00
510	1		1.0	30.40	133.00	4.16	6.87	.	.	.	.	.	.	.	.
510	1		2.0	30.30	133.00	0.83	6.82	0.410	0.600	0.035	0.10	0.012	.	.	10.00
510	1		2.3	30.30	136.00	2.68	6.61	.	.	.	.	.	.	.	.
510	1		0.3	30.40	132.00	4.55	6.99	0.520	0.600	0.063	0.10	0.015	.	.	15.00
510	1		1.0	30.50	132.00	4.25	6.95	.	.	.	.	.	.	.	.
510	1		2.0	30.40	132.00	3.82	6.86	0.490	0.800	0.060	0.10	0.011	.	.	10.00
510	1		2.3	30.40	186.00	0.65	6.12	.	.	.	.	.	.	.	.
607		1	0.3	.	.	.	.	0.720	.	0.050	0.10	0.024	.	.	15.00
607		1	2.0	.	.	.	.	0.610	.	0.030	0.10	0.024	.	.	10.00
607		1	9.9	.	.	.	.	6.400	.	0.070	0.10	0.025	.	.	40.00
607	1		0.3	.	.	.	.	0.670	.	0.040	0.10	0.025	.	.	20.00
607	1		2.0	.	.	.	.	0.640	.	0.030	0.10	0.030	.	.	10.00
607	1		9.9	.	.	.	.	1.900	.	0.040	0.10	0.024	.	.	15.00
414		2	0.3	29.80	125.00	7.49	8.64	0.550	0.450	0.050	0.11	0.010	39.00	47.00	10.00
414		2	0.3	29.80	125.00	7.49	8.64	.	.	0.100	0.10	0.022	.	.	.
414		2	1.0	29.00	126.00	7.59	8.62	.	.	.	.	.	.	.	.
414		2	2.0	28.70	126.00	4.81	7.80	.	.	.	.	.	.	.	.
414		2	3.5	28.40	125.00	2.40	7.20	.	.	0.160	0.16	0.025	.	.	.
414		2	0.3	29.80	128.00	6.78	8.30	0.450	0.330	0.047	0.12	0.011	41.00	49.00	10.00
414		2	1.0	29.30	128.00	5.93	8.05	.	.	.	.	.	.	.	.
414		2	2.0	29.10	129.00	4.63	7.59	0.480	0.400	0.100	0.16	0.010	43.00	46.00	15.00
414		2	4.8	28.60	130.00	1.97	7.20	.	.	0.070	0.11	0.026	.	.	.
414		2	0.3	30.50	129.00	7.41	8.14	0.540	0.170	0.088	0.10	0.010	43.00	48.00	10.00
414		2	1.0	29.60	129.00	6.96	7.80	.	.	.	.	.	.	.	.
414		2	2.0	29.30	129.00	6.73	7.68	0.700	0.300	0.025	0.29	0.010	43.00	49.00	12.00
414		2	3.2	29.00	129.00	6.13	7.51	1.300	0.370	0.015	0.32	0.013	40.00	52.00	15.00
414	2		0.3	30.70	130.00	8.44	8.69	1.200	0.450	0.016	0.26	0.010	41.00	51.00	10.00
414	2		0.3	30.70	130.00	8.44	8.69	.	.	0.070	0.10	0.020	.	.	.
414	2		1.0	29.40	130.00	6.70	8.05	.	.	.	.	.	.	.	.
414	2		2.0	29.00	139.00	4.44	7.51	1.600	0.730	0.029	0.34	0.022	44.00	52.00	15.00
414	2		4.0	28.70	130.00	2.38	7.25	.	.	0.150	0.10	0.037	.	.	.
414	2		0.3	30.00	124.00	8.64	8.78	1.800	0.350	0.030	0.10	0.010	44.00	46.00	20.00
414	2		1.0	29.10	125.00	7.21	8.25	.	.	.	.	.	.	.	.
414	2		2.0	28.70	126.00	6.44	7.96	1.600	0.300	0.020	0.10	0.011	47.00	50.00	10.00
414	2		3.1	28.50	126.00	2.29	7.38	3.800	0.320	0.025	0.11	0.015	43.00	54.00	20.00
414	2		0.3	29.70	128.00	8.35	8.60	0.430	0.530	0.015	0.29	0.010	43.00	51.00	5.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
414	2		1.0	29.30	128.00	7.24	8.23	.	.	.	.	.	.	.	.
414	2		2.0	29.10	129.00	4.15	7.46	1.300	0.500	0.016	0.10	0.010	45.00	51.00	10.00
414	2		4.0	28.70	145.00	0.93	7.14	5.400	0.450	0.045	0.10	0.021	45.00	51.00	20.00
423		2	0.3	31.40	127.00	6.87	8.04	.	.	.	.	.	.	.	.
423		2	1.0	30.60	125.00	7.05	8.00	.	.	.	.	.	.	.	.
423		2	2.0	29.60	125.00	4.49	7.23	.	.	.	.	.	.	.	.
423		2	3.3	29.10	128.00	0.54	6.67	.	.	.	.	.	.	.	.
423		2	0.3	31.20	125.00	10.57	8.81	.	.	.	.	.	.	.	.
423		2	1.0	30.50	125.00	9.14	8.55	.	.	.	.	.	.	.	.
423		2	2.0	29.70	126.00	6.01	7.71	.	.	.	.	.	.	.	.
423		2	4.9	28.70	125.00	1.33	7.00	.	.	.	.	.	.	.	.
423	2		0.3	31.60	127.00	7.00	8.11	.	.	.	.	.	.	.	.
423	2		1.0	30.40	126.00	6.87	8.03	.	.	.	.	.	.	.	.
423	2		2.0	29.60	125.00	6.31	7.83	.	.	.	.	.	.	.	.
423	2		3.9	29.00	125.00	1.31	6.90	.	.	.	.	.	.	.	.
423	2		0.3	31.20	126.00	6.96	7.92	.	.	.	.	.	.	.	.
423	2		1.0	30.20	125.00	6.86	7.91	.	.	.	.	.	.	.	.
423	2		2.0	29.70	125.00	6.63	7.78	.	.	.	.	.	.	.	.
423	2		3.9	28.90	131.00	0.25	6.71	.	.	.	.	.	.	.	.
423	2		0.3	31.20	124.00	9.50	8.33	.	.	.	.	.	.	.	.
423	2		1.0	30.10	123.00	8.43	8.29	.	.	.	.	.	.	.	.
423	2		2.0	29.90	124.00	8.26	8.11	.	.	.	.	.	.	.	.
423	2		4.2	28.80	131.00	0.30	6.66	.	.	.	.	.	.	.	.
425		2	0.3	.	.	.	.	1.100	0.620	0.021	0.10	0.010	42.00	47.00	10.00
425		2	2.0	.	.	.	.	1.300	0.650	0.053	0.10	0.010	42.00	50.00	15.00
425		2	9.9	.	.	.	.	3.500	1.670	0.086	0.15	0.012	40.00	51.00	50.00
425		2	0.3	.	.	.	.	1.100	0.870	0.021	0.10	0.010	41.00	47.00	15.00
425		2	2.0	.	.	.	.	1.700	1.300	0.030	0.10	0.010	44.00	50.00	10.00
425		2	9.9	.	.	.	.	2.500	1.080	0.028	0.10	0.010	42.00	50.00	15.00
425		2	0.3	.	.	.	.	1.500	1.400	0.039	0.10	0.010	43.00	49.00	10.00
425		2	2.0	.	.	.	.	0.650	0.650	0.025	0.10	0.010	42.00	50.00	5.00
425		2	9.9	.	.	.	.	4.800	0.850	0.082	0.10	0.010	43.00	52.00	20.00
425	2		0.3	.	.	.	.	0.560	1.950	0.010	0.10	0.010	44.00	53.00	15.00
425	2		2.0	.	.	.	.	0.520	0.780	0.015	0.10	0.010	40.00	51.00	10.00
425	2		9.9	.	.	.	.	1.400	1.100	0.020	0.10	0.010	40.00	52.00	20.00
425	2		0.3	.	.	.	.	0.610	0.620	0.015	0.10	0.010	41.00	50.00	10.00
425	2		2.0	.	.	.	.	0.470	0.510	0.020	0.10	0.010	40.00	52.00	10.00
425	2		9.9	.	.	.	.	1.300	2.050	0.040	0.10	0.010	39.00	51.00	15.00
425	2		0.3	.	.	.	.	0.710	0.800	0.010	0.10	0.011	42.00	48.00	15.00
425	2		2.0	.	.	.	.	1.300	1.030	0.010	0.10	0.010	39.00	52.00	10.00
425	2		9.9	.	.	.	.	5.400	2.500	0.015	0.10	0.010	42.00	51.00	40.00
502		2	0.3	32.30	119.00	6.13	7.57	0.520	0.810	0.020	0.14	0.010	43.00	39.00	10.00
502		2	1.0	31.50	126.00	6.08	7.51	.	.	.	.	.	.	.	.
502		2	2.0	30.60	124.00	4.51	7.05	0.610	1.000	0.040	0.12	0.010	41.00	43.00	15.00
502		2	3.5	29.30	159.00	0.22	6.49	15.000	2.120	0.040	0.16	0.033	43.00	44.00	70.00
502		2	0.3	31.80	114.00	7.02	7.93	0.440	0.920	0.030	0.10	0.010	43.00	40.00	10.00
502		2	1.0	30.90	126.00	5.83	7.41	.	.	.	.	.	.	.	.
502		2	2.0	30.30	126.00	5.19	7.24	0.540	0.950	0.030	0.10	0.010	42.00	39.00	20.00
502		2	5.8	28.70	134.00	0.07	6.46	3.300	5.750	0.460	0.44	0.022	44.00	39.00	60.00
502		2	0.3	32.00	108.00	9.14	8.44	0.390	1.250	0.050	0.10	0.010	44.00	40.00	10.00
502		2	1.0	30.70	110.00	7.53	7.72	.	.	.	.	.	.	.	.
502		2	2.0	30.20	128.00	6.52	7.39	0.670	1.400	0.010	0.13	0.010	43.00	43.00	15.00
502		2	3.6	29.70	138.00	1.40	6.66	1.000	1.120	0.010	0.20	0.011	45.00	47.00	15.00
502	2		0.3	30.60	126.00	5.06	7.23	0.540	1.400	0.020	0.10	0.012	46.00	43.00	15.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
502	2		1.0	30.20	126.00	5.07	7.22	.	.	.	.	.	.	.	.
502	2		2.0	30.00	126.00	5.14	7.20	0.620	0.970	0.015	0.10	0.150	42.00	44.00	10.00
502	2		4.3	29.40	139.00	0.14	6.60	3.000	5.270	0.060	0.10	0.065	45.00	47.00	55.00
502	2		0.3	30.30	123.00	5.51	7.43	0.460	1.650	0.010	0.10	0.010	44.00	41.00	10.00
502	2		1.0	30.00	126.00	5.48	7.40	.	.	.	.	.	.	.	.
502	2		2.0	30.00	127.00	5.43	7.38	0.450	1.420	0.010	0.15	0.014	43.00	41.00	10.00
502	2		4.3	29.20	146.00	0.10	6.56	3.000	3.970	0.020	0.15	0.025	45.00	46.00	45.00
502	2		0.3	30.70	127.00	6.32	7.44	0.530	1.420	0.010	0.10	0.010	45.00	42.00	10.00
502	2		1.0	30.10	127.00	5.21	7.27	.	.	.	.	.	.	.	.
502	2		2.0	29.90	127.00	3.93	7.08	0.620	1.320	0.010	0.10	0.011	43.00	46.00	15.00
502	2		3.6	29.70	130.00	0.97	6.83	2.500	4.120	0.010	0.10	0.024	46.00	44.00	45.00
509		2	0.3	31.20	129.00	1.60	7.07	0.460	0.900	0.058	0.10	0.010	.	.	10.00
509		2	1.0	31.00	129.00	4.63	7.03	.	.	.	.	.	.	.	.
509		2	2.0	30.70	129.00	3.97	6.87	0.820	1.500	0.010	0.10	0.011	.	.	20.00
509		2	3.6	30.30	138.00	1.50	6.57	3.200	1.870	0.175	0.11	0.022	.	.	45.00
509		2	0.3	31.20	129.00	5.14	7.20	0.440	0.780	0.022	0.10	0.011	.	.	10.00
509		2	1.0	31.10	129.00	4.92	7.14	.	.	.	.	.	.	.	.
509		2	2.0	30.90	130.00	4.69	7.06	0.590	1.000	0.040	0.10	0.019	.	.	15.00
509		2	5.1	30.30	137.00	0.15	6.37	5.100	4.380	0.001	0.20	0.022	.	.	50.00
509		2	0.3	31.40	126.00	6.60	7.95	0.460	1.100	0.055	0.10	0.012	.	.	10.00
509		2	1.0	30.80	130.00	5.64	7.38	.	.	.	.	.	.	.	.
509		2	2.0	30.60	130.00	4.90	7.20	0.590	0.580	0.027	0.10	0.012	.	.	15.00
509		2	3.3	30.50	130.00	2.09	6.74	0.470	1.050	0.039	0.10	0.010	.	.	15.00
509	2		0.3	31.00	128.00	5.06	7.17	0.410	0.630	0.020	0.10	0.011	.	.	10.00
509	2		1.0	30.80	130.00	4.26	7.01	.	.	.	.	.	.	.	.
509	2		2.0	30.60	130.00	4.09	6.95	0.470	0.700	0.036	0.10	0.011	.	.	15.00
509	2		4.3	30.40	116.00	2.77	6.73	1.600	1.600	0.075	0.15	0.030	.	.	35.00
509	2		0.3	31.10	124.00	5.57	7.35	0.430	0.550	0.010	0.10	0.012	.	.	10.00
509	2		1.0	30.80	130.00	5.59	7.32	.	.	.	.	.	.	.	.
509	2		2.0	30.60	131.00	4.52	7.09	0.330	0.670	0.027	0.10	0.010	.	.	10.00
509	2		4.3	30.30	134.00	0.26	6.52	0.420	0.650	0.027	0.10	0.010	.	.	15.00
509	2		0.3	31.20	131.00	5.34	7.25	0.360	0.600	0.026	0.10	0.010	.	.	10.00
509	2		1.0	30.70	130.00	4.14	6.96	.	.	.	.	.	.	.	.
509	2		2.0	30.60	130.00	4.28	6.97	0.360	0.670	0.026	0.10	0.010	.	.	10.00
509	2		3.8	30.50	125.00	3.25	6.80	0.430	1.170	0.013	0.10	0.012	.	.	15.00
606		2	0.3	.	.	.	.	0.610	.	0.020	0.10	0.026	.	.	10.00
606		2	2.0	.	.	.	.	0.530	.	0.010	0.10	0.011	.	.	10.00
606		2	9.9	.	.	.	.	2.500	.	0.050	0.10	0.024	.	.	20.00
606	2		0.3	.	.	.	.	0.530	.	0.010	0.10	0.023	.	.	15.00
606	2		2.0	.	.	.	.	0.510	.	0.030	0.10	0.020	.	.	10.00
606	2		9.9	.	.	.	.	2.200	.	0.030	0.10	0.023	.	.	20.00
414		3	0.3	29.70	128.00	6.20	7.82	.	.	0.080	0.10	0.010	.	.	.
414		3	1.0	29.50	129.00	5.90	7.61	.	.	.	.	.	.	.	.
414		3	2.0	29.10	129.00	5.64	7.63	.	.	0.065	0.10	0.011	.	.	.
414		3	6.9	28.60	143.00	0.10	7.04	.	.	0.125	0.15	0.018	.	.	.
414		3	0.3	29.30	129.00	5.85	7.74	.	.	0.070	0.10	0.010	.	.	.
414		3	1.0	29.20	129.00	5.74	7.73	.	.	.	.	.	.	.	.
414		3	2.0	29.00	129.00	5.49	7.71	.	.	0.076	0.10	0.010	.	.	.
414		3	6.1	28.40	130.00	0.86	7.17	.	.	0.040	0.10	0.012	.	.	.
414		3	0.3	29.60	126.00	7.69	8.61	.	.	0.060	0.16	0.020	.	.	.
414		3	1.0	29.10	128.00	6.84	7.92	.	.	.	.	.	.	.	.
414		3	2.0	28.90	128.00	6.70	8.04	.	.	0.040	0.10	0.012	.	.	.
414		3	3.1	28.80	129.00	5.52	7.66	.	.	0.060	0.13	0.025	.	.	.
414		3	0.3	29.40	126.00	6.60	7.87	.	.	0.017	0.10	0.010	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
414		3	1.0	29.20	130.00	5.76	7.72	.	.	.	.	.	.	.	.
414		3	2.0	28.90	132.00	3.99	7.38	.	.	0.089	0.10	0.012	.	.	.
414		3	5.9	28.60	140.00	1.18	7.08	.	.	0.140	0.13	0.015	.	.	.
414	3		0.3	29.40	126.00	6.72	8.04	.	.	0.078	0.10	0.027	.	.	.
414	3		1.0	29.20	128.00	6.33	7.84	.	.	.	.	.	.	.	.
414	3		2.0	29.00	129.00	4.78	7.65	.	.	0.088	0.10	0.025	.	.	.
414	3		3.7	28.80	132.00	0.89	7.16	.	.	0.130	0.10	0.035	.	.	.
414	3		0.3	29.70	127.00	7.65	8.69	.	.	0.040	0.10	0.027	.	.	.
414	3		1.0	29.00	129.00	5.35	7.83	.	.	.	.	.	.	.	.
414	3		2.0	.	.	.	.	.	.	0.090	0.12	0.034	.	.	.
414	3		1.8	28.00	129.00	4.83	7.72	.	.	.	.	.	.	.	.
414	3		0.3	29.10	127.00	6.25	7.94	.	.	0.140	0.10	0.018	.	.	.
414	3		1.0	29.10	129.00	4.97	7.62	.	.	.	.	.	.	.	.
414	3		2.0	28.90	130.00	3.13	7.34	.	.	0.085	0.10	0.016	.	.	.
414	3		2.1	28.80	131.00	2.12	7.24	.	.	0.130	0.12	0.035	.	.	.
419		3	0.3	29.20	128.00	5.42	7.46	.	.	.	.	.	.	.	.
419		3	1.0	29.20	128.00	5.39	7.43	.	.	.	.	.	.	.	.
419		3	2.0	29.00	128.00	5.27	7.44	.	.	.	.	.	.	.	.
419		3	5.5	28.60	131.00	0.25	6.88	.	.	.	.	.	.	.	.
419	3		0.3	30.00	127.00	5.75	7.83	.	.	.	.	.	.	.	.
419	3		1.0	29.10	131.00	5.37	7.40	.	.	.	.	.	.	.	.
419	3		2.0	29.00	130.00	5.32	7.39	.	.	.	.	.	.	.	.
419	3		3.2	28.90	130.00	2.52	7.04	.	.	.	.	.	.	.	.
419	3		0.3	30.70	128.00	7.08	8.23	.	.	.	.	.	.	.	.
419	3		1.0	29.10	128.00	5.75	7.67	.	.	.	.	.	.	.	.
419	3		2.0	29.00	128.00	5.16	7.57	.	.	.	.	.	.	.	.
419	3		0.3	29.90	128.00	6.36	7.57	.	.	.	.	.	.	.	.
419	3		1.0	29.00	131.00	5.90	7.47	.	.	.	.	.	.	.	.
419	3		2.0	29.00	131.00	3.78	7.10	.	.	.	.	.	.	.	.
425		3	0.3	30.80	128.00	6.13	7.58	0.560	0.320	0.115	0.10	0.010	43.00	51.00	10.00
425		3	1.0	30.00	127.00	5.21	7.34	.	.	.	.	.	.	.	.
425		3	2.0	29.50	127.00	4.41	7.19	0.720	0.220	0.022	0.10	0.010	44.00	49.00	10.00
425		3	7.3	28.30	154.00	0.11	6.73	5.900	0.600	0.170	0.20	0.062	52.00	63.00	60.00
425		3	0.3	30.60	129.00	6.42	7.52	0.530	0.100	0.027	0.10	0.010	43.00	38.00	10.00
425		3	1.0	30.00	129.00	5.58	7.44	.	.	.	.	.	.	.	.
425		3	2.0	29.60	129.00	4.25	7.17	0.550	0.300	0.039	0.10	0.010	44.00	50.00	15.00
425		3	6.7	28.40	133.00	0.07	6.80	2.700	0.900	0.100	0.10	0.010	52.00	52.00	40.00
425		3	0.3	30.20	127.00	6.39	7.85	0.590	0.570	0.041	0.10	0.010	43.00	50.00	10.00
425		3	1.0	29.80	128.00	5.65	7.56	.	.	.	.	.	.	.	.
425		3	2.0	29.50	128.00	4.91	7.31	0.610	0.310	0.059	0.10	0.010	44.00	51.00	15.00
425		3	3.7	28.90	130.00	1.24	6.90	1.200	0.720	0.015	0.10	0.010	.	53.00	10.00
425		3	0.3	30.40	124.00	5.54	7.45	0.500	0.670	0.010	0.10	0.010	44.00	51.00	5.00
425		3	1.0	29.80	124.00	5.18	7.41	.	.	.	.	.	.	.	.
425		3	2.0	29.40	125.00	4.10	7.17	0.560	0.920	0.010	0.10	0.010	42.00	52.00	10.00
425		3	6.0	28.40	150.00	0.35	6.73	5.700	0.780	0.150	0.15	0.014	54.00	63.00	50.00
425	3		0.3	30.10	128.00	6.92	8.02	0.630	0.850	0.020	0.10	0.010	42.00	52.00	15.00
425	3		1.0	29.80	128.00	5.42	7.49	.	.	.	.	.	.	.	.
425	3		2.0	29.40	129.00	4.45	7.24	1.200	0.550	0.020	0.10	0.010	42.00	51.00	10.00
425	3		4.0	28.90	131.00	0.23	6.82	2.800	1.350	0.080	0.10	0.013	42.00	52.00	20.00
425	3		0.3	30.30	128.00	6.39	7.65	1.800	1.170	0.050	0.10	0.010	42.00	53.00	20.00
425	3		1.0	29.60	128.00	5.54	7.39	.	.	.	.	.	.	.	.
425	3		2.0	29.40	128.00	4.94	7.21	1.200	0.700	0.040	0.10	0.010	40.00	52.00	15.00
425	3		2.8	29.10	116.00	1.06	6.86	3.800	1.200	0.040	0.10	0.010	42.00	49.00	30.00
425	3		0.3	30.50	127.00	6.36	7.76	1.100	1.400	0.040	0.10	0.010	42.00	50.00	15.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
425	3		1.0	29.70	128.00	5.71	7.58	.	.	.	.	.	.	.	.
425	3		2.0	29.50	130.00	2.75	7.01	2.500	1.100	0.140	0.14	0.014	42.00	54.00	20.00
502		3	0.3	32.00	127.00	7.19	8.14	0.570	1.250	0.010	0.10	0.010	45.00	42.00	10.00
502		3	1.0	30.70	128.00	6.01	7.56	.	.	.	.	.	.	.	.
502		3	2.0	30.40	129.00	5.41	7.36	0.450	1.250	0.010	0.14	0.010	44.00	42.00	15.00
502		3	6.6	28.50	124.00	1.33	6.68	36.000	1.600	0.200	0.30	0.024	45.00	36.00	70.00
502		3	0.3	32.30	121.00	7.15	8.20	0.350	1.000	0.040	0.16	0.010	44.00	41.00	15.00
502		3	1.0	30.50	128.00	5.88	7.49	.	.	.	.	.	.	.	.
502		3	2.0	30.20	128.00	5.74	7.43	0.370	1.150	0.010	0.10	0.010	43.00	41.00	10.00
502		3	7.5	28.00	142.00	0.08	6.62	4.500	4.650	0.290	0.30	0.034	45.00	43.00	65.00
502		3	0.3	31.80	127.00	8.80	8.54	0.380	1.200	0.010	0.10	0.012	44.00	42.00	10.00
502		3	1.0	30.60	127.00	6.78	7.79	.	.	.	.	.	.	.	.
502		3	2.0	30.10	128.00	5.48	7.37	0.460	1.220	0.010	0.13	0.010	44.00	43.00	15.00
502		3	3.6	29.60	132.00	2.47	6.91	2.600	1.650	0.010	0.22	0.014	44.00	42.00	20.00
502		3	0.3	31.70	128.00	7.12	8.15	0.440	1.220	0.010	0.10	0.010	45.00	42.00	5.00
502		3	1.0	30.40	128.00	5.76	7.42	.	.	.	.	.	.	.	.
502		3	2.0	30.10	129.00	5.16	7.27	0.420	1.250	0.010	0.10	0.010	44.00	44.00	10.00
502		3	6.3	27.80	105.00	1.57	6.61	33.000	1.520	0.120	0.30	0.024	41.00	27.00	65.00
502	3		0.3	30.00	129.00	5.63	7.49	0.670	1.070	0.020	0.10	0.011	44.00	45.00	15.00
502	3		1.0	30.00	129.00	5.58	7.48	.	.	.	.	.	.	.	.
502	3		2.0	29.90	129.00	5.64	7.46	0.520	1.320	0.010	0.10	0.010	44.00	43.00	10.00
502	3		3.7	29.80	130.00	0.30	6.76	3.200	2.350	0.160	0.15	0.060	45.00	48.00	35.00
502	3		0.3	29.90	133.00	5.64	7.43	0.860	1.600	0.020	0.15	0.010	43.00	40.00	15.00
502	3		1.0	29.80	131.00	5.02	7.30	.	.	.	.	.	.	.	.
502	3		2.0	29.80	131.00	4.48	7.19	0.420	1.170	0.010	0.13	0.010	43.00	38.00	20.00
502	3		4.0	29.30	135.00	0.48	6.75	17.000	2.700	0.040	0.14	0.021	45.00	45.00	70.00
502	3		0.3	30.10	128.00	6.50	7.87	0.540	1.400	0.010	0.10	0.067	42.00	42.00	10.00
502	3		1.0	29.90	129.00	5.69	7.58	.	.	.	.	.	.	.	.
502	3		2.0	29.80	129.00	5.23	7.40	0.560	1.030	0.010	0.10	0.010	43.00	44.00	15.00
502	3		2.6	29.60	131.00	3.35	7.10	.	.	.	.	.	.	.	.
509		3	0.3	30.90	131.00	5.87	7.63	0.390	0.850	0.023	0.10	0.010	.	.	10.00
509		3	1.0	30.70	131.00	5.90	7.58	.	.	.	.	.	.	.	.
509		3	2.0	30.60	131.00	5.70	7.47	0.420	0.650	0.050	0.10	0.017	.	.	15.00
509		3	7.2	29.80	124.00	0.70	6.58	5.600	0.980	0.120	0.14	0.020	.	.	55.00
509		3	0.3	30.70	132.00	5.70	7.46	0.390	0.620	0.025	0.10	0.010	.	.	10.00
509		3	1.0	30.70	133.00	5.69	7.48	.	.	.	.	.	.	.	.
509		3	2.0	30.50	133.00	5.62	7.45	0.360	0.650	0.028	0.10	0.011	.	.	5.00
509		3	5.1	30.20	139.00	0.15	6.58	2.300	1.220	0.170	0.18	0.048	.	.	25.00
509		3	0.3	30.90	110.00	7.00	7.95	0.440	0.750	0.020	0.10	0.016	.	.	10.00
509		3	1.0	30.60	132.00	5.48	7.36	.	.	.	.	.	.	.	.
509		3	2.0	30.60	132.00	5.00	7.26	0.340	0.450	0.026	0.10	0.010	.	.	15.00
509		3	3.5	30.40	131.00	2.77	6.86	0.570	0.700	0.057	0.10	0.010	.	.	15.00
509		3	0.3	30.90	131.00	5.36	7.39	0.410	0.570	0.025	0.10	0.011	.	.	10.00
509		3	1.0	30.60	132.00	4.99	7.30	.	.	.	.	.	.	.	.
509		3	2.0	30.50	132.00	4.95	7.27	0.480	0.380	0.028	0.10	0.017	.	.	10.00
509		3	6.3	29.60	143.00	0.76	6.53	3.700	1.130	0.110	0.18	0.016	.	.	50.00
509	3		0.3	30.80	135.00	6.75	7.66	0.420	0.500	0.035	0.10	0.011	.	.	10.00
509	3		1.0	30.60	135.00	6.33	7.44	.	.	.	.	.	.	.	.
509	3		2.0	30.50	136.00	6.39	7.35	0.530	0.170	0.037	0.10	0.013	.	.	10.00
509	3		3.1	30.50	135.00	2.40	6.73	1.600	0.650	0.085	0.10	0.015	.	.	20.00
509	3		0.3	30.80	132.00	6.88	7.93	0.340	0.500	0.033	0.10	0.010	.	.	10.00
509	3		1.0	30.60	123.00	5.89	7.54	.	.	.	.	.	.	.	.
509	3		2.0	30.50	131.00	5.20	7.34	0.360	0.500	0.034	0.12	0.010	.	.	10.00
509	3		2.6	30.40	120.00	4.79	7.24	0.680	0.850	0.046	0.14	0.011	.	.	15.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
509	3		0.3	30.60	148.00	6.28	7.33	0.610	0.580	0.040	0.10	0.015	.	.	10.00
509	3		1.0	30.50	144.00	6.20	7.34	.	.	.	.	.	.	.	.
509	3		2.0	30.50	144.00	6.22	7.32	0.640	0.740	0.053	0.10	0.019	.	.	15.00
509	3		3.0	30.40	147.00	4.51	6.85	2.400	0.720	0.063	0.10	0.024	.	.	20.00
606		3	0.3	.	.	.	.	0.710	.	0.020	0.10	0.020	.	.	5.00
606		3	2.0	.	.	.	.	0.570	.	0.020	0.10	0.020	.	.	10.00
606		3	9.9	.	.	.	.	2.300	.	0.070	0.10	0.024	.	.	40.00
606	3		0.3	.	.	.	.	0.520	.	0.020	0.10	0.029	.	.	10.00
606	3		2.0	.	.	.	.	0.490	.	0.020	0.10	0.021	.	.	10.00
606	3		9.9	.	.	.	.	1.400	.	0.040	0.10	0.021	.	.	15.00
414		4	0.3	30.20	129.00	6.69	8.42	0.380	0.170	0.010	0.29	0.010	41.00	52.00	10.00
414		4	1.0	30.10	129.00	6.81	8.14	.	.	.	.	.	.	.	.
414		4	2.0	29.40	129.00	6.99	8.21	1.700	4.350	0.023	0.32	0.014	44.00	48.00	20.00
414		4	4.1	28.80	128.00	3.77	7.46	3.200	0.850	0.056	0.26	0.029	40.00	51.00	20.00
414		4	0.3	29.70	129.00	7.76	6.43	0.440	0.200	0.010	0.30	0.010	40.00	51.00	10.00
414		4	1.0	29.50	129.00	7.41	8.24	.	.	.	.	.	.	.	.
414		4	2.0	29.10	129.00	5.50	7.74	0.370	0.020	0.012	0.32	0.010	42.00	54.00	15.00
414		4	4.9	28.70	139.00	1.72	7.11	5.900	0.270	0.110	0.32	0.040	41.00	54.00	20.00
414	4		0.3	30.30	128.00	8.81	8.94	3.400	1.100	0.020	0.10	0.013	46.00	46.00	10.00
414	4		1.0	29.80	129.00	6.87	8.09	.	.	.	.	.	.	.	.
414	4		2.0	29.00	129.00	4.99	7.67	1.200	0.500	0.055	0.10	0.011	44.00	52.00	15.00
414	4		3.0	28.90	129.00	3.25	7.37	3.200	0.550	0.074	0.10	0.026	43.00	50.00	15.00
414	4		0.3	31.10	130.00	8.57	8.90	.	.	.	.	.	.	.	.
414	4		1.0	30.20	129.00	6.98	8.13	.	.	.	.	.	.	.	.
414	4		0.3	31.40	129.00	8.03	8.70	1.500	0.480	0.029	0.10	0.012	44.00	48.00	10.00
414	4		1.0	30.00	129.00	7.57	8.08	.	.	.	.	.	.	.	.
414	4		2.0	29.50	130.00	7.04	7.80	1.100	0.500	0.013	0.10	0.010	44.00	50.00	10.00
414	4		3.8	28.80	132.00	3.50	7.16	1.500	0.130	0.075	0.10	0.012	45.00	54.00	10.00
421		4	0.3	.	.	.	.	.	.	0.055	0.10	0.010	.	.	.
421		4	2.0	.	.	.	.	.	.	0.058	0.10	0.010	.	.	.
421		4	9.9	.	.	.	.	.	.	0.170	0.13	0.020	.	.	.
421		4	0.3	.	.	.	.	.	.	0.085	0.10	0.010	.	.	.
421		4	2.0	.	.	.	.	.	.	0.062	0.10	0.010	.	.	.
421		4	9.9	.	.	.	.	.	.	0.250	0.22	0.030	.	.	.
425		4	0.3	29.90	125.00	5.49	7.49	0.460	0.500	0.010	0.10	0.010	44.00	51.00	15.00
425		4	1.0	29.70	128.00	5.17	7.38	.	.	.	.	.	.	.	.
425		-4	2.0	29.40	128.00	4.71	7.26	0.430	0.780	0.010	0.10	0.010	40.00	51.00	15.00
425		4	6.3	28.10	158.00	0.08	6.71	16.000	1.750	0.160	0.16	0.015	54.00	65.00	50.00
425		4	0.3	29.90	128.00	5.24	7.52	0.420	0.580	0.010	0.10	0.010	43.00	51.00	15.00
425		4	1.0	29.70	129.00	4.89	7.33	.	.	.	.	.	.	.	.
425		4	2.0	29.30	130.00	4.27	7.19	0.520	0.460	0.015	0.10	0.010	43.00	52.00	10.00
425		4	5.2	28.30	156.00	0.25	6.70	4.600	1.000	0.110	0.11	0.013	52.00	62.00	60.00
425	4		0.3	31.00	126.00	7.41	8.02	0.760	1.520	0.040	0.12	0.010	40.00	53.00	15.00
425	4		1.0	29.60	128.00	4.72	7.43	.	.	.	.	.	.	.	.
425	4		1.4	29.40	129.00	3.47	7.16	.	.	.	.	.	.	.	.
425	4		0.3	29.60	128.00	5.52	7.62	0.480	0.650	0.050	0.10	0.010	42.00	53.00	10.00
425	4		1.0	29.50	129.00	4.82	7.51	.	.	.	.	.	.	.	.
425	4		2.0	29.30	129.00	4.55	7.30	0.540	0.800	0.015	0.10	0.010	42.00	50.00	10.00
425	4		3.0	29.00	131.00	0.84	6.91	2.600	0.900	0.015	0.10	0.011	40.00	54.00	30.00
425	4		0.3	29.50	127.00	5.34	7.49	2.000	1.200	0.080	0.15	0.011	42.00	54.00	20.00
425	4		1.0	29.40	128.00	4.66	7.35	.	.	.	.	.	.	.	.
425	4		2.0	29.30	129.00	4.03	7.23	1.300	0.570	0.050	0.10	0.013	42.00	52.00	10.00
428		4	0.3	29.20	130.00	4.55	7.19	1.600	0.500	0.010	0.10	0.010	46.00	54.00	20.00
428		4	1.0	29.10	130.00	4.37	7.18	.	.	.	.	.	.	.	.

S T A T I S T I C A L   A N A L Y S I S   S Y S T E M   9:07 FRIDAY, JUNE 20, 1980

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
428		4	2.0	29.00	131.00	2.92	7.07	1.900	0.450	0.010	0.10	0.010	43.00	55.00	15.00
428		4	6.1	25.80	114.00	0.95	6.52	48.000	1.320	0.140	0.30	0.036	38.00	34.00	70.00
428		4	0.3	29.10	134.00	4.14	7.07	2.100	0.470	0.010	0.10	0.010	42.00	51.00	15.00
428		4	1.0	29.10	133.00	4.15	7.11	.	.	.	.	.	.	.	.
428		4	2.0	28.90	132.00	4.29	7.15	1.800	0.200	0.010	0.12	0.010	42.00	56.00	20.00
428		4	4.9	25.90	118.00	0.91	6.48	57.000	1.200	0.230	0.32	0.044	36.00	29.00	65.00
428	4		0.3	29.50	129.00	1.63	7.25	1.700	0.200	0.015	0.10	0.010	43.00	55.00	20.00
428	4		1.0	29.10	129.00	4.05	7.17	.	.	.	.	.	.	.	.
428	4		2.0	29.10	130.00	4.02	7.17	1.900	0.350	0.020	0.15	0.010	42.00	54.00	20.00
428	4		4.1	26.30	107.00	0.82	6.54	60.000	0.850	0.150	0.27	0.060	36.00	31.00	70.00
428	4		0.3	29.40	127.00	5.11	7.35	1.300	0.570	0.020	0.10	0.012	41.00	56.00	10.00
428	4		1.0	29.10	127.00	4.69	7.26	.	.	.	.	.	.	.	.
428	4		1.7	28.80	128.00	3.34	7.03	.	.	.	.	.	.	.	.
428	4		0.3	29.80	128.00	5.03	7.31	2.300	0.350	0.010	0.10	0.012	40.00	53.00	10.00
428	4		1.0	29.20	130.00	4.06	7.16	.	.	.	.	.	.	.	.
428	4		2.0	28.90	129.00	3.88	7.15	1.700	0.200	0.010	0.10	0.010	43.00	53.00	20.00
428	4		3.9	26.80	118.00	0.84	6.64	35.000	0.870	0.100	0.16	0.033	40.00	40.00	40.00
508		4	0.3	31.00	126.00	6.17	7.86	0.430	0.530	0.530	0.12	0.010	.	.	10.00
508		4	1.0	30.90	129.00	5.74	7.67	.	.	.	.	.	.	.	.
508		4	2.0	30.60	129.00	5.18	7.53	0.540	.	0.670	0.12	0.010	.	.	15.00
508		4	6.3	29.20	143.00	0.34	6.80	5.400	1.370	0.180	0.24	0.019	.	.	60.00
508		4	0.3	30.80	129.00	5.47	7.70	0.440	0.350	0.025	0.10	0.010	.	.	10.00
508		4	1.0	30.60	129.00	5.42	7.70	.	.	.	.	.	.	.	.
508		4	2.0	30.60	130.00	4.26	7.36	0.570	0.700	0.027	0.10	0.010	.	.	15.00
508		4	5.5	29.10	146.00	0.29	6.77	5.400	1.340	0.200	0.26	0.018	.	.	65.00
508	4		0.3	31.20	129.00	6.00	7.79	0.460	0.400	.	0.10	.	.	.	10.00
508	4		1.0	30.70	130.00	5.74	7.64	.	.	.	.	.	.	.	.
508	4		2.0	30.60	130.00	5.64	7.60	0.380	.	0.048	0.10	0.010	.	.	15.00
508	4		4.1	30.30	131.00	1.50	6.99	6.100	0.850	0.046	0.10	0.017	.	.	50.00
508	4		0.3	31.40	129.00	7.32	8.35	1.500	0.800	0.022	0.10	0.010	.	.	15.00
508	4		1.0	30.90	130.00	5.77	7.81	.	.	.	.	.	.	.	.
508	4		2.0	30.60	130.00	5.35	7.65	0.710	0.450	0.024	0.10	0.010	.	.	15.00
508	4		3.4	30.40	135.00	1.10	6.98	8.600	1.030	0.027	0.11	0.023	.	.	70.00
508	4		0.3	31.60	129.00	6.69	8.13	0.490	0.700	0.026	0.10	0.014	.	.	10.00
508	4		1.0	30.80	130.00	5.38	7.63	.	.	.	.	.	.	.	.
508	4		2.0	30.50	131.00	3.60	7.26	1.300	0.770	0.013	0.10	0.015	.	.	20.00
515		4	0.3	30.60	128.00	5.38	7.25	0.650	0.400	0.080	0.10	0.011	.	.	10.00
515		4	1.0	30.50	128.00	4.94	7.15	.	.	.	.	.	.	.	.
515		4	2.0	30.00	128.00	3.82	7.03	4.100	0.560	0.050	0.12	0.017	.	.	30.00
515		4	6.3	27.90	137.00	1.28	6.63	.	.	.	.	.	.	.	.
515		4	0.3	30.50	128.00	4.68	7.31	0.650	0.650	0.080	0.10	0.013	.	.	15.00
515		4	1.0	30.20	129.00	3.78	7.06	.	.	.	.	.	.	.	.
515		4	2.0	30.00	129.00	3.85	7.04	0.670	0.500	0.070	0.10	0.013	.	.	15.00
515		4	5.5	27.50	139.00	1.29	6.62	9.600	0.950	0.040	0.10	0.024	.	.	65.00
515	4		0.3	30.40	128.00	4.53	7.05	0.640	0.350	0.080	0.10	0.057	.	.	20.00
515	4		1.0	30.60	128.00	4.57	7.08	.	.	.	.	.	.	.	.
515	4		2.0	30.10	128.00	4.92	7.16	0.800	1.100	0.100	0.10	0.019	.	.	10.00
515	4		4.2	29.80	129.00	1.88	6.74	2.200	1.200	0.040	0.10	0.048	.	.	30.00
515	4		0.3	31.10	127.00	5.40	7.30	0.710	0.450	0.070	0.10	0.010	.	.	15.00
515	4		1.0	30.40	128.00	4.74	7.13	.	.	.	.	.	.	.	.
515	4		2.0	30.00	128.00	4.21	7.04	0.630	0.400	0.080	0.10	0.015	.	.	15.00
515	4		3.9	29.80	123.00	3.17	6.96	1.400	0.570	0.030	0.10	0.017	.	.	20.00
515	4		0.3	30.80	126.00	6.82	7.70	0.650	0.600	0.080	0.10	0.014	.	.	10.00
515	1		1.0	30.30	126.00	5.90	7.36	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
515	4		2.0	29.90	122.00	3.39	6.91	0.790	0.400	0.090	0.10	0.018	.	.	15.00
605		4	0.3	.	.	.	.	0.500	.	0.060	0.10	0.024	.	.	5.00
605		4	2.0	.	.	.	.	0.530	.	0.030	0.10	0.150	.	.	5.00
605		4	9.9	.	.	.	.	4.500	.	0.080	0.10	0.049	.	.	50.00
605	4		0.3	.	.	.	.	0.540	.	0.030	0.10	0.055	.	.	10.00
605	4		2.0	.	.	.	.	0.730	.	0.010	0.10	0.024	.	.	10.00
605	4		9.9	.	.	.	.	1.000	.	0.030	0.10	0.025	.	.	10.00
412		5	0.3	29.70	129.00	7.09	8.39	0.440	.	0.055	0.10	0.010	43.00	51.00	10.00
412		5	1.0	29.40	129.00	6.15	7.92	.	.	.	.	.	.	.	.
412		5	2.0	29.00	130.00	5.76	7.82	0.410	.	0.030	0.10	0.010	44.00	50.00	15.00
412		5	8.6	28.30	138.00	1.28	7.30	0.410	.	0.065	0.14	0.012	47.00	54.00	20.00
412		5	0.3	29.60	128.00	6.78	8.20	0.720	0.050	0.024	0.10	0.010	45.00	53.00	15.00
412		5	1.0	29.30	129.00	6.34	7.97	.	.	.	.	.	.	.	.
412		5	2.0	29.00	129.00	5.67	7.83	0.510	0.050	0.039	0.11	0.010	44.00	52.00	10.00
412		5	9.4	28.30	137.00	0.93	7.30	0.920	0.400	0.050	0.13	0.010	43.00	55.00	10.00
412	5		0.3	30.60	126.00	8.92	8.71	.	.	.	.	.	.	.	.
412	5		1.0	29.50	128.00	7.29	8.20	.	.	.	.	.	.	.	.
412	5		2.0	29.20	128.00	6.43	8.00	.	.	.	.	.	.	.	.
412	5		4.6	28.80	130.00	0.89	7.19	.	.	.	.	.	.	.	.
412	5		0.3	30.60	128.00	8.38	8.88	1.400	1.300	0.115	0.12	0.018	43.00	49.00	10.00
412	5		1.0	29.40	129.00	6.68	7.98	.	.	.	.	.	.	.	.
412	5		2.0	29.10	129.00	6.19	7.91	0.360	0.100	0.046	0.10	0.010	40.00	51.00	10.00
412	5		4.0	28.70	129.00	2.51	7.50	3.600	0.100	0.041	0.10	0.010	45.00	51.00	15.00
412	5		0.3	31.30	130.00	8.51	8.99	0.420	0.050	0.035	0.10	0.010	42.00	49.00	10.00
412	5		1.0	29.30	129.00	6.76	8.04	.	.	.	.	.	.	.	.
412	5		2.0	29.00	129.00	7.70	7.86	0.320	0.250	0.015	0.10	0.010	44.00	44.00	.
412	5		4.9	28.50	132.00	1.12	7.26	8.200	.	0.074	0.10	0.028	48.00	53.00	25.00
413		5	0.3	29.50	128.00	7.27	8.29	0.450	0.200	0.050	0.10	0.010	41.00	51.00	15.00
413		5	1.0	29.40	128.00	7.20	8.32	.	.	.	.	.	.	.	.
413		5	2.0	29.30	128.00	6.72	8.13	0.460	0.100	0.070	0.10	0.010	42.00	50.00	10.00
413		5	9.6	28.30	133.00	0.78	7.29	1.200	0.400	0.097	0.16	0.010	43.00	49.00	15.00
413	5		0.3	.	.	.	.	0.470	0.530	0.086	0.10	0.010	43.00	38.00	10.00
413	5		2.0	.	.	.	.	0.560	0.300	0.054	0.13	0.010	43.00	50.00	10.00
413	5		9.9	.	.	.	.	1.600	0.100	0.110	0.10	0.010	40.00	51.00	15.00
420	5		0.3	30.60	125.00	8.24	8.55	.	.	.	.	.	.	.	.
420	5		1.0	30.50	129.00	7.35	8.19	.	.	.	.	.	.	.	.
420	5		2.0	29.50	129.00	6.91	8.18	.	.	.	.	.	.	.	.
420	5		3.8	29.20	129.00	2.57	7.14	.	.	.	.	.	.	.	.
420	5		0.3	30.90	129.00	7.77	8.25	.	.	.	.	.	.	.	.
420	5		1.0	29.80	129.00	7.01	7.83	.	.	.	.	.	.	.	.
420	5		2.0	29.50	129.00	6.24	7.75	.	.	.	.	.	.	.	.
420	5		4.3	29.20	129.00	2.11	7.07	.	.	.	.	.	.	.	.
420	5		0.3	30.80	128.00	7.91	8.27	.	.	.	.	.	.	.	.
420	5		1.0	29.90	128.00	7.10	8.08	.	.	.	.	.	.	.	.
420	5		2.0	29.70	128.00	6.36	7.80	.	.	.	.	.	.	.	.
420	5		3.6	29.40	128.00	2.03	7.04	.	.	.	.	.	.	.	.
423		5	0.3	31.20	128.00	5.30	7.37	.	.	.	.	.	.	.	.
423		5	1.0	30.40	128.00	4.90	7.30	.	.	.	.	.	.	.	.
423		5	2.0	29.20	128.00	3.77	7.26	.	.	.	.	.	.	.	.
423		5	9.5	28.20	139.00	1.93	6.94	.	.	.	.	.	.	.	.
423		5	0.3	31.30	129.00	5.99	7.40	.	.	.	.	.	.	.	.
423		5	1.0	31.10	128.00	5.81	7.35	.	.	.	.	.	.	.	.
423		5	2.0	29.70	128.00	5.43	7.28	.	.	.	.	.	.	.	.
423		5	9.1	28.30	140.00	2.41	6.92	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
423		5	0.3	31.50	128.00	5.80	7.52	.	.	.	.	.	.	.	.
423		5	1.0	29.80	128.00	4.67	7.25	.	.	.	.	.	.	.	.
423		5	2.0	29.40	128.00	4.68	7.27	.	.	.	.	.	.	.	.
423		5	8.6	28.40	141.00	1.55	6.88	.	.	.	.	.	.	.	.
423	5		0.3	31.60	129.00	6.16	7.50	.	.	.	.	.	.	.	.
423	5		1.0	30.20	128.00	6.20	7.59	.	.	.	.	.	.	.	.
423	5		2.0	29.30	128.00	5.10	7.34	.	.	.	.	.	.	.	.
423	5		5.3	28.90	134.00	2.18	7.04	.	.	.	.	.	.	.	.
423	5		0.3	31.20	126.00	6.00	7.38	.	.	.	.	.	.	.	.
423	5		1.0	30.60	127.00	5.13	7.33	.	.	.	.	.	.	.	.
423	5		2.0	29.50	127.00	4.68	7.28	.	.	.	.	.	.	.	.
423	5		3.8	29.10	128.00	4.17	7.22	.	.	.	.	.	.	.	.
423	5		0.3	31.50	129.00	5.78	7.52	.	.	.	.	.	.	.	.
423	5		1.0	30.50	128.00	5.08	7.34	.	.	.	.	.	.	.	.
423	5		2.0	29.60	128.00	5.18	7.38	.	.	.	.	.	.	.	.
423	5		8.6	28.90	130.00	0.74	6.87	.	.	.	.	.	.	.	.
426		5	0.3	31.00	119.00	6.73	7.88	0.560	1.020	0.100	0.10	0.010	38.00	52.00	15.00
426		5	1.0	30.90	126.00	6.78	7.86	.	.	.	.	.	.	.	.
426		5	2.0	30.10	126.00	6.20	7.58	0.550	1.270	0.100	0.10	0.010	40.00	57.00	10.00
426		5	8.8	28.30	156.00	0.60	6.78	3.600	1.250	0.140	0.14	0.011	50.00	63.00	40.00
426		5	0.3	31.10	127.00	6.89	7.97	0.520	0.950	0.100	0.10	0.010	39.00	54.00	5.00
426		5	1.0	30.60	126.00	6.55	7.85	.	.	.	.	.	.	.	.
426		5	2.0	30.20	126.00	6.01	7.60	0.540	1.330	0.130	0.14	0.010	40.00	51.00	10.00
426		5	8.9	28.30	155.00	0.17	6.77	3.600	0.950	0.180	0.18	0.014	48.00	61.00	50.00
426		5	0.3	31.10	126.00	7.44	8.25	0.480	1.150	0.100	0.10	0.010	40.00	53.00	10.00
426		5	1.0	30.80	126.00	6.85	8.08	.	.	.	.	.	.	.	.
426		5	2.0	30.10	127.00	5.95	7.55	0.450	1.050	0.140	0.14	0.010	41.00	52.00	10.00
426		5	8.1	28.50	152.00	0.09	6.77	0.390	0.970	0.120	0.12	0.012	49.00	62.00	40.00
426	5		0.3	31.10	127.00	6.86	7.96	0.510	1.220	0.100	0.10	0.010	41.00	54.00	10.00
426	5		1.0	30.60	127.00	6.77	7.91	.	.	.	.	.	.	.	.
426	5		2.0	30.20	127.00	4.34	7.20	0.580	1.220	0.100	0.10	0.010	42.00	52.00	10.00
426	5		4.2	29.50	134.00	0.24	6.68	3.900	5.270	0.210	0.21	0.022	42.00	57.00	50.00
426	5		0.3	30.70	125.00	6.68	7.86	0.480	1.130	0.070	0.10	0.010	41.00	53.00	10.00
426	5		1.0	30.60	126.00	6.69	7.84	.	.	.	.	.	.	.	.
426	5		2.0	30.20	127.00	5.85	7.52	0.560	1.300	0.070	0.11	0.010	40.00	52.00	15.00
426	5		4.9	29.20	136.00	0.26	6.77	4.200	3.920	0.160	0.24	0.016	44.00	53.00	50.00
426	5		0.3	31.00	123.00	6.95	8.02	0.580	0.950	0.090	0.12	0.010	38.00	52.00	15.00
426	5		1.0	30.40	127.00	6.81	7.92	.	.	.	.	.	.	.	.
426	5		2.0	30.20	127.00	5.07	7.35	0.520	1.230	0.100	0.10	0.010	40.00	53.00	10.00
426	5		4.1	29.30	136.00	0.12	6.68	2.700	3.070	0.150	0.12	0.014	42.00	55.00	30.00
503		5	0.3	31.50	129.00	7.08	8.24	0.370	0.550	0.010	0.10	0.066	42.00	42.00	10.00
503		5	1.0	31.00	129.00	6.55	8.03	.	.	.	.	.	.	.	.
503		5	2.0	30.60	129.00	5.69	7.59	0.310	0.450	0.010	0.10	0.018	43.00	41.00	30.00
503		5	9.2	28.20	129.00	0.09	6.72	4.900	0.050	0.120	0.22	0.025	44.00	41.00	10.00
503		5	0.3	31.50	129.00	7.23	8.34	0.270	0.430	0.010	0.10	0.017	42.00	41.00	15.00
503		5	1.0	31.10	129.00	7.04	8.24	.	.	.	.	.	.	.	.
503		5	2.0	30.50	129.00	6.13	7.76	0.380	0.760	0.010	0.10	0.018	42.00	41.00	10.00
503		5	8.7	28.20	128.00	0.08	6.71	5.600	2.070	0.120	0.20	0.036	44.00	40.00	55.00
503		5	0.3	31.50	130.00	7.60	8.34	0.280	0.270	0.010	0.10	0.011	41.00	41.00	10.00
503		5	1.0	31.20	129.00	7.22	8.18	.	.	.	.	.	.	.	.
503		5	2.0	30.60	129.00	6.85	8.05	0.320	0.750	0.030	0.12	0.013	44.00	44.00	15.00
503		5	8.7	28.30	129.00	0.09	6.70	5.200	1.870	0.140	0.22	0.075	45.00	41.00	55.00
503	5		0.3	31.50	129.00	6.80	8.16	0.260	0.170	0.020	0.10	0.010	43.00	38.00	10.00
503	5		1.0	30.80	129.00	6.16	7.87	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
503	5		2.0	30.50	130.00	3.18	7.17	0.340	0.720	0.020	0.10	0.010	45.00	38.00	10.00
503	5		3.5	30.00	134.00	1.62	6.94	3.400	0.900	0.040	0.14	0.015	45.00	41.00	30.00
503	5		0.3	31.70	123.00	7.19	8.25	0.320	0.350	0.010	0.11	0.057	41.00	40.00	10.00
503	5		1.0	31.00	126.00	6.80	8.07	.	.	.	.	.	.	.	.
503	5		2.0	30.60	127.00	5.05	7.38	0.280	0.650	0.010	0.10	0.017	44.00	44.00	10.00
503	5		3.4	30.30	129.00	1.33	6.95	3.500	2.600	0.060	0.16	0.059	45.00	41.00	55.00
503	5		0.3	31.00	134.00	7.73	8.31	0.340	0.700	0.010	0.10	0.010	43.00	43.00	10.00
503	5		1.0	31.10	133.00	6.95	8.09	.	.	.	.	.	.	.	.
503	5		2.0	30.50	133.00	5.44	7.44	0.280	0.450	0.020	0.10	0.030	44.00	44.00	10.00
503	5		4.9	29.70	134.00	0.25	6.60	1.300	3.900	0.240	0.17	0.029	47.00	44.00	35.00
510		5	0.3	31.70	126.00	5.86	7.71	0.350	0.700	0.047	0.10	0.010	.	.	10.00
510		5	1.0	31.50	128.00	5.60	7.62	.	.	.	.	.	.	.	.
510		5	2.0	30.90	129.00	5.14	7.31	0.370	0.600	0.041	0.10	0.011	.	.	10.00
510		5	9.2	29.70	144.00	0.20	6.50	3.200	1.750	0.150	0.16	0.021	.	.	45.00
510		5	0.3	31.40	127.00	6.08	7.84	0.330	0.500	0.030	0.10	0.013	.	.	10.00
510		5	1.0	31.20	128.00	5.94	7.78	.	.	.	.	.	.	.	.
510		5	2.0	30.90	128.00	6.11	7.84	0.370	0.650	0.040	0.10	0.010	.	.	15.00
510		5	7.5	29.80	143.00	0.10	6.51	3.100	2.000	0.130	0.16	0.022	.	.	45.00
510		5	0.3	31.20	128.00	6.39	8.11	0.370	4.100	0.035	0.10	0.010	.	.	15.00
510		5	1.0	31.00	128.00	6.47	8.13	.	.	.	.	.	.	.	.
510		5	2.0	30.90	129.00	5.95	7.85	0.300	4.350	0.074	0.10	0.010	.	.	10.00
510		5	9.7	29.70	147.00	0.10	6.52	2.900	6.320	0.110	0.15	0.021	.	.	40.00
510	5		0.3	31.40	128.00	5.93	7.74	0.340	4.050	0.045	0.10	0.010	.	.	15.00
510	5		1.0	31.20	128.00	5.78	7.65	.	.	.	.	.	.	.	.
510	5		2.0	30.80	129.00	5.49	7.48	0.400	4.150	0.050	0.10	0.010	.	.	10.00
510	5		5.8	30.10	137.00	0.13	6.53	1.900	7.100	0.120	0.10	0.029	.	.	20.00
510	5		0.3	31.30	129.00	6.31	8.05	0.370	4.200	0.040	0.10	0.011	.	.	10.00
510	5		1.0	31.40	126.00	6.22	7.86	.	.	.	.	.	.	.	.
510	5		2.0	30.90	129.00	5.23	7.37	0.330	3.650	0.064	0.10	0.015	.	.	10.00
510	5		4.8	30.40	151.00	0.21	6.46	3.200	6.650	0.170	0.20	0.040	.	.	45.00
510	5		0.3	31.10	128.00	6.25	7.96	0.330	4.000	0.055	0.10	0.010	.	.	10.00
510	5		1.0	31.10	129.00	6.21	7.86	.	.	.	.	.	.	.	.
510	5		2.0	30.90	129.00	5.40	7.45	0.390	4.050	0.052	0.10	0.013	.	.	15.00
510	5		4.5	30.60	132.00	0.31	6.44	1.400	6.670	0.180	0.25	0.028	.	.	10.00
607		5	0.3	.	.	.	.	0.550	.	0.030	0.10	0.022	.	.	10.00
607		5	2.0	.	.	.	.	0.570	.	0.030	0.10	0.021	.	.	10.00
607		5	9.9	.	.	.	.	15.000	.	0.080	0.10	0.028	.	.	50.00
607	5		0.3	.	.	.	.	0.570	.	0.040	0.10	0.022	.	.	10.00
607	5		2.0	.	.	.	.	0.610	.	0.040	0.10	0.022	.	.	10.00
607	5		9.9	.	.	.	.	7.100	.	0.060	0.10	0.040	.	.	30.00
411		6	0.3	30.70	119.00	8.11	8.80	0.580	0.300	0.015	0.10	0.010	42.00	51.00	10.00
411		6	1.0	29.20	122.00	6.27	7.81	.	.	.	.	.	.	.	.
411		6	2.0	28.90	122.00	5.92	7.64	0.430	0.250	0.039	0.10	0.010	43.00	51.00	10.00
411		6	6.5	28.50	128.00	2.21	6.95	1.500	0.050	0.051	0.10	0.010	46.00	53.00	10.00
411		6	0.3	29.70	125.00	6.76	7.68	0.530	0.050	0.017	0.10	0.010	45.00	55.00	10.00
411		6	1.0	29.20	125.00	6.20	7.50	.	.	.	.	.	.	.	.
411		6	2.0	28.90	125.00	5.22	7.37	0.430	0.150	0.028	0.10	0.010	42.00	50.00	15.00
411		6	9.4	28.20	134.00	1.26	6.77	0.950	0.050	0.040	0.10	0.010	46.00	55.00	15.00
411		6	0.3	29.90	125.00	6.32	7.81	0.510	0.100	0.070	0.10	0.010	43.00	53.00	10.00
411		6	1.0	29.60	125.00	5.83	7.66	.	.	.	.	.	.	.	.
411		6	2.0	28.80	125.00	5.15	7.44	0.490	0.200	0.025	0.10	0.010	42.00	51.00	15.00
411		6	9.8	28.20	134.00	1.13	6.76	1.000	.	0.070	0.12	0.010	45.00	53.00	10.00
411	6		0.3	29.40	124.00	7.24	8.35	0.730	0.600	0.030	0.10	0.010	43.00	51.00	10.00
411	6		2.0	28.90	125.00	5.88	7.79	1.200	0.350	0.017	0.10	0.010	44.00	41.00	15.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
411	6		4.6	28.60	139.00	0.65	6.79	2.400	0.150	0.040	0.10	0.010	44.00	52.00	15.00
411	6		0.3	31.50	131.00	11.23	9.17	0.980	0.150	0.023	0.10	0.010	42.00	50.00	10.00
411	6		2.0	28.70	123.00	7.80	7.52	1.200	0.100	0.020	0.12	0.010	42.00	49.00	10.00
411	6		4.6	28.60	125.00	2.12	7.07	1.400	.	0.025	0.10	0.010	44.00	52.00	10.00
411	6		0.3	29.40	124.00	8.70	8.81	0.650	0.150	0.020	0.10	0.013	42.00	52.00	10.00
411	6		2.0	29.00	125.00	6.10	7.65	0.550	0.050	0.018	0.10	0.010	43.00	51.00	10.00
411	6		4.0	28.60	127.00	2.12	7.04	1.600	0.050	0.022	0.10	0.010	43.00	51.00	15.00
420		6	0.3	30.00	130.00	6.85	8.23	.	.	.	.	.	.	.	.
420		6	1.0	29.80	130.00	6.50	8.19	.	.	.	.	.	.	.	.
420		6	2.0	29.60	130.00	6.33	7.96	.	.	.	.	.	.	.	.
420		6	10.8	28.60	155.00	0.07	6.89	.	.	.	.	.	.	.	.
420		6	0.3	29.90	129.00	7.37	8.21	.	.	.	.	.	.	.	.
420		6	1.0	29.60	130.00	6.83	7.92	.	.	.	.	.	.	.	.
420		6	2.0	29.60	130.00	6.39	7.83	.	.	.	.	.	.	.	.
420		6	8.7	28.60	151.00	0.23	6.88	.	.	.	.	.	.	.	.
420		6	0.3	30.00	131.00	7.84	8.33	.	.	.	.	.	.	.	.
420		6	1.0	29.70	131.00	6.77	7.99	.	.	.	.	.	.	.	.
420		6	2.0	29.60	131.00	6.39	7.92	.	.	.	.	.	.	.	.
420		6	7.6	28.80	146.00	0.16	6.87	.	.	.	.	.	.	.	.
420	6		0.3	29.90	140.00	7.94	8.39	.	.	.	.	.	.	.	.
420	6		1.0	29.60	139.00	7.12	8.21	.	.	.	.	.	.	.	.
420	6		2.0	29.50	138.00	6.45	8.00	.	.	.	.	.	.	.	.
420	6		4.5	29.20	142.00	0.22	6.97	.	.	.	.	.	.	.	.
420	6		0.3	30.10	131.00	7.83	8.36	.	.	.	.	.	.	.	.
420	6		1.0	29.70	132.00	6.54	7.97	.	.	.	.	.	.	.	.
420	6		2.0	29.60	131.00	6.52	7.98	.	.	.	.	.	.	.	.
420	6		3.8	29.30	131.00	1.57	7.10	.	.	.	.	.	.	.	.
420	6		0.3	30.40	136.00	7.86	8.51	.	.	.	.	.	.	.	.
420	6		1.0	29.70	135.00	7.49	8.44	.	.	.	.	.	.	.	.
420	6		2.0	29.60	134.00	6.58	8.16	.	.	.	.	.	.	.	.
420	6		4.5	29.20	145.00	0.40	6.81	.	.	.	.	.	.	.	.
423		6	0.3	31.20	127.00	5.67	7.47	.	.	.	.	.	.	.	.
423		6	1.0	30.10	128.00	4.31	7.23	.	.	.	.	.	.	.	.
423		6	2.0	29.30	128.00	4.06	7.21	.	.	.	.	.	.	.	.
423		6	8.0	28.50	139.00	1.91	6.94	.	.	.	.	.	.	.	.
423		6	0.3	31.00	127.00	5.82	7.51	.	.	.	.	.	.	.	.
423		6	1.0	30.60	128.00	5.38	7.37	.	.	.	.	.	.	.	.
423		6	2.0	29.40	128.00	5.08	7.24	.	.	.	.	.	.	.	.
423		6	7.5	28.60	136.00	2.94	6.94	.	.	.	.	.	.	.	.
423		6	0.3	31.10	128.00	5.96	7.50	.	.	.	.	.	.	.	.
423		6	1.0	30.10	128.00	5.00	7.31	.	.	.	.	.	.	.	.
423		6	2.0	29.30	128.00	4.48	7.22	.	.	.	.	.	.	.	.
423		6	8.6	28.60	138.00	1.51	6.92	.	.	.	.	.	.	.	.
423	6		0.3	30.80	127.00	5.61	7.39	.	.	.	.	.	.	.	.
423	6		1.0	30.10	128.00	4.65	7.23	.	.	.	.	.	.	.	.
423	6		2.0	29.50	128.00	4.27	7.18	.	.	.	.	.	.	.	.
423	6		4.1	29.00	134.00	1.29	6.79	.	.	.	.	.	.	.	.
423	6		0.3	30.60	128.00	5.80	7.48	.	.	.	.	.	.	.	.
423	6		1.0	30.00	128.00	4.87	7.26	.	.	.	.	.	.	.	.
423	6		2.0	29.20	128.00	4.75	7.30	.	.	.	.	.	.	.	.
423	6		5.0	28.90	130.00	2.21	7.00	.	.	.	.	.	.	.	.
423	6		0.3	31.20	128.00	5.73	7.29	.	.	.	.	.	.	.	.
423	6		1.0	29.80	127.00	5.46	7.30	.	.	.	.	.	.	.	.
423	6		1.5	29.50	128.00	4.55	7.20	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
426		6	0.3	30.70	127.00	6.67	7.92	0.620	0.770	0.050	0.10	0.010	42.00	53.00	10.00
426		6	1.0	30.50	127.00	6.42	7.78	.	.	.	.	.	.	.	.
426		6	2.0	30.10	126.00	5.92	7.62	0.640	0.620	0.040	0.10	0.010	41.00	51.00	10.00
426		6	9.0	28.40	153.00	0.09	6.75	4.800	0.820	0.160	0.14	0.011	51.00	62.00	45.00
426		6	0.3	30.20	127.00	7.29	8.12	0.680	0.650	0.010	0.10	0.010	41.00	51.00	10.00
426		6	1.0	30.30	126.00	7.28	8.19	.	.	.	.	.	.	.	.
426		6	2.0	30.10	128.00	6.25	7.60	1.200	0.870	0.010	0.10	0.010	40.00	52.00	15.00
426		6	6.5	28.90	137.00	0.42	6.81	4.200	1.370	0.020	0.10	0.010	43.00	55.00	50.00
426		6	0.3	30.80	127.00	7.63	8.20	0.760	1.200	0.010	0.10	0.010	41.00	49.00	10.00
426		6	1.0	30.40	126.00	6.97	7.97	.	.	.	.	.	.	.	.
426		6	2.0	30.20	127.00	6.02	7.58	0.750	0.820	0.010	0.10	0.010	41.00	52.00	15.00
426		6	8.5	28.80	139.00	0.09	6.83	2.900	0.670	0.070	0.11	0.010	44.00	58.00	25.00
426	6		0.3	30.60	125.00	6.96	7.92	0.530	1.020	0.020	0.10	0.010	41.00	52.00	10.00
426	6		1.0	30.30	126.00	6.65	7.82	.	.	.	.	.	.	.	.
426	6		2.0	30.10	127.00	6.17	7.70	0.590	0.450	0.020	0.10	0.010	40.00	53.00	10.00
426	6		4.6	29.20	133.00	0.52	6.75	0.650	0.570	0.020	0.10	0.010	40.00	53.00	10.00
426	6		0.3	30.60	126.00	6.61	7.92	0.780	0.870	0.050	0.10	0.010	40.00	53.00	10.00
426	6		1.0	30.20	126.00	6.60	7.90	.	.	.	.	.	.	.	.
426	6		2.0	30.00	126.00	5.18	7.45	0.610	0.850	0.060	0.11	0.010	43.00	53.00	15.00
426	6		4.5	29.20	135.00	0.21	6.71	3.500	1.150	0.080	0.10	0.010	43.00	57.00	40.00
426	6		0.3	30.70	126.00	6.75	7.96	0.590	1.220	0.050	0.12	0.010	43.00	49.00	15.00
426	6		1.0	30.50	126.00	6.20	7.70	.	.	.	.	.	.	.	.
426	6		2.0	30.20	127.00	4.93	7.31	0.540	0.700	0.040	0.10	0.010	44.00	53.00	10.00
426	6		3.4	29.50	132.00	0.40	6.67	2.300	1.720	0.060	0.10	0.010	44.00	55.00	20.00
503		6	0.3	.	.	.	.	0.330	1.100	0.015	0.10	0.013	44.00	41.00	15.00
503		6	2.0	.	.	.	.	0.240	0.200	0.010	0.10	0.017	45.00	44.00	10.00
503		6	9.9	.	.	.	.	4.800	1.100	0.001	0.14	0.022	16.00	41.00	50.00
503		6	0.3	.	.	.	.	0.240	0.670	0.020	0.10	0.016	42.00	44.00	10.00
503		6	2.0	.	.	.	.	0.790	0.400	0.010	0.10	0.039	43.00	43.00	45.00
503		6	9.9	.	.	.	.	4.600	1.450	0.080	0.15	0.014	46.00	44.00	10.00
503		6	0.3	.	.	.	.	0.340	0.620	0.010	0.10	0.010	42.00	43.00	10.00
503		6	2.0	.	.	.	.	0.280	1.270	0.010	0.10	0.010	44.00	47.00	40.00
503		6	9.9	.	.	.	.	5.100	1.550	0.070	0.16	0.014	45.00	44.00	10.00
503	6		0.3	31.00	127.00	7.50	8.44	0.520	0.920	0.010	0.11	0.010	43.00	44.00	10.00
503	6		1.0	30.90	126.00	7.50	8.45	.	.	.	.	.	.	.	.
503	6		2.0	30.60	129.00	7.12	8.27	0.290	1.430	0.030	0.10	0.010	42.00	44.00	10.00
503	6		5.2	29.60	138.00	0.72	6.89	2.400	1.640	0.080	0.16	0.010	44.00	48.00	20.00
503	6		0.3	31.00	129.00	7.18	8.24	0.450	0.350	0.020	0.10	0.010	43.00	46.00	15.00
503	6		1.0	30.60	129.00	7.22	8.32	.	.	.	.	.	.	.	.
503	6		2.0	30.40	131.00	1.95	7.38	0.370	0.890	0.020	0.10	0.010	42.00	46.00	10.00
503	6		3.3	30.20	139.00	0.58	6.64	1.500	2.090	0.020	0.12	0.031	45.00	44.00	15.00
503	6		0.3	30.90	130.00	6.66	8.03	0.280	0.350	0.010	0.10	0.010	43.00	45.00	26.00
503	6		1.0	30.70	130.00	7.33	8.35	.	.	.	.	.	.	.	.
503	6		2.0	30.50	132.00	3.52	7.15	0.320	1.670	0.020	0.15	0.010	43.00	45.00	10.00
503	6		2.4	30.50	134.00	2.28	6.96	.	.	.	.	.	.	.	.
510		6	0.3	31.30	129.00	6.35	8.14	0.440	4.450	0.030	0.10	0.010	.	.	10.00
510		6	1.0	30.90	128.00	6.24	8.01	.	.	.	.	.	.	.	.
510		6	2.0	30.80	128.00	6.41	8.05	0.320	3.700	0.053	0.10	0.011	.	.	15.00
510		6	10.1	29.60	147.00	0.08	6.59	2.600	6.270	0.135	0.15	0.021	.	.	40.00
510		6	0.3	31.40	128.00	6.95	8.33	0.280	4.580	0.042	0.10	0.011	.	.	10.00
510		6	1.0	31.30	128.00	6.85	8.27	.	.	.	.	.	.	.	.
510		6	2.0	30.90	128.00	6.70	8.21	0.470	4.250	0.068	0.10	0.015	.	.	15.00
510		6	5.1	30.30	133.00	0.17	6.59	2.800	6.420	0.170	0.20	0.053	.	.	30.00
510		6	0.3	31.70	127.00	6.99	8.35	0.340	4.500	0.055	0.10	0.010	.	.	5.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
510		6	1.0	31.60	127.00	7.48	8.48	.	.	.	.	.	.	.	.
510		6	2.0	30.80	127.00	6.80	8.27	0.730	5.200	0.052	0.10	0.015	.	.	10.00
510		6	2.1	30.00	140.00	0.10	6.53	2.400	5.970	0.130	0.18	0.021	.	.	25.00
510	6		0.3	31.50	128.00	6.65	8.22	0.380	4.100	0.062	0.14	0.010	.	.	10.00
510	6		1.0	31.00	128.00	6.51	8.17	.	.	.	.	.	.	.	.
510	6		2.0	30.90	128.00	5.95	7.86	0.290	3.800	0.071	0.10	0.010	.	.	5.00
510	6		4.1	30.50	131.00	3.05	6.87	0.520	5.800	0.080	0.10	0.014	.	.	20.00
510	6		0.3	31.20	128.00	6.72	8.18	2.800	4.170	0.045	0.10	0.010	.	.	10.00
510	6		1.0	31.20	128.00	6.57	8.13	.	.	.	.	.	.	.	.
510	6		2.0	30.80	128.00	6.32	7.94	0.350	3.850	0.084	0.10	0.010	.	.	15.00
510	6		3.2	30.70	128.00	5.50	7.52	0.320	5.220	0.090	0.10	0.012	.	.	20.00
510	6		0.3	31.30	128.00	6.58	8.14	0.390	4.130	0.084	0.10	0.010	.	.	15.00
510	6		1.0	31.00	128.00	6.45	7.98	.	.	.	.	.	.	.	.
510	6		2.0	30.80	128.00	6.73	8.16	0.370	4.100	0.050	0.10	0.013	.	.	10.00
510	6		2.6	30.80	129.00	5.88	7.92	0.490	5.350	0.080	0.10	0.015	.	.	10.00
607		6	0.3	.	.	.	.	0.560	.	0.030	0.10	0.026	.	.	10.00
607		6	2.0	.	.	.	.	0.540	.	0.050	0.10	0.024	.	.	10.00
607		6	9.9	.	.	.	.	4.000	.	0.070	0.10	0.030	.	.	30.00
607	6		0.3	.	.	.	.	0.510	.	0.010	0.10	0.019	.	.	10.00
607	6		2.0	.	.	.	.	0.630	.	0.040	0.10	0.020	.	.	15.00
607	6		9.9	.	.	.	.	8.200	.	0.060	0.10	0.023	.	.	40.00
415		7	0.3	29.60	130.00	8.85	8.86	0.570	0.050	0.050	0.10	0.010	36.00	47.00	15.00
415		7	1.0	29.50	132.00	8.40	8.67	.	.	.	.	.	.	.	.
415		7	2.0	29.40	132.00	7.89	8.59	.	.	0.040	0.10	0.010	.	.	.
415		7	3.0	29.30	138.00	6.02	8.09	1.200	0.250	0.045	0.10	0.012	39.00	50.00	12.00
415		7	0.3	29.80	126.00	8.99	8.71	.	.	0.020	0.10	0.010	.	.	.
415		7	1.0	29.60	128.00	8.16	8.52	.	.	.	.	.	.	.	.
415		7	2.0	29.30	129.00	6.36	7.88	0.450	0.400	0.038	0.10	0.010	41.00	50.00	10.00
415		7	3.7	29.20	130.00	0.83	7.07	1.500	0.350	0.062	0.10	0.011	40.00	53.00	15.00
415	7		0.3	29.40	125.00	9.18	8.76	1.100	0.300	0.069	0.10	0.010	39.00	42.00	15.00
415	7		1.0	29.30	128.00	8.11	8.55	.	.	.	.	.	.	.	.
415	7		2.0	29.30	128.00	7.46	8.41	5.500	0.250	0.115	0.10	0.010	41.00	49.00	10.00
415	7		2.8	29.20	129.00	4.17	7.61	.	.	0.060	0.10	0.027	.	.	.
415	7		0.3	29.80	125.00	9.71	9.04	.	.	0.020	0.10	0.010	.	.	.
415	7		1.0	29.50	128.00	9.17	8.95	.	.	.	.	.	.	.	.
415	7		2.0	.	.	.	.	.	.	0.050	0.10	0.015	.	.	.
415	7		1.9	29.30	130.00	3.16	7.98	.	.	.	.	.	.	.	.
415	7		0.3	29.90	124.00	9.71	8.97	0.560	0.300	0.047	0.10	0.010	36.00	48.00	10.00
415	7		1.0	29.60	130.00	8.42	8.66	.	.	.	.	.	.	.	.
415	7		2.0	29.30	130.00	9.12	8.57	0.510	0.300	0.046	0.10	0.010	42.00	49.00	10.00
415	7		4.0	29.00	132.00	4.18	6.95	2.500	0.750	0.125	0.15	0.014	42.00	52.00	17.00
425	7		0.3	31.60	127.00	10.93	8.75	1.100	0.420	0.030	0.12	0.010	38.00	49.00	10.00
425	7		1.0	30.70	125.00	8.00	8.39	.	.	.	.	.	.	.	.
425	7		2.0	30.20	120.00	5.81	7.55	0.660	1.150	0.050	0.10	0.010	40.00	52.00	10.00
425	7		2.6	29.70	175.00	0.82	6.28	6.200	2.320	0.070	0.13	0.031	47.00	60.00	40.00
425	7		0.3	31.50	126.00	9.41	8.35	0.510	0.900	0.015	0.10	0.010	42.00	52.00	10.00
425	7		1.0	30.90	125.00	9.13	8.49	.	.	.	.	.	.	.	.
425	7		2.0	30.20	125.00	7.30	8.12	0.400	0.900	0.020	0.10	0.010	42.00	51.00	10.00
425	7		3.5	29.40	141.00	0.37	6.56	1.600	0.320	0.030	0.10	0.010	39.00	52.00	15.00
425	7		0.3	31.50	124.00	9.77	8.54	0.490	0.600	0.015	0.10	0.010	40.00	51.00	10.00
425	7		1.0	30.60	124.00	6.90	7.99	.	.	.	.	.	.	.	.
425	7		2.0	.	.	.	.	3.200	1.670	0.110	0.18	0.022	43.00	54.00	30.00
425	7		1.7	30.10	141.00	3.32	6.62	.	.	.	.	.	.	.	.
426		7	0.3	29.60	123.00	7.66	8.15	.	.	.	.	.	.	.	.

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
426		7	1.0	29.90	124.00	7.30	8.13	.	.	.	.	.	.	.	.
426		7	2.0	29.90	126.00	7.10	8.10	.	.	.	.	.	.	.	.
426		7	4.1	29.30	152.00	0.27	6.51	.	.	.	.	.	.	.	.
426		7	0.3	31.40	122.00	10.19	8.71	0.570	0.400	0.030	0.10	0.010	38.00	46.00	15.00
426		7	1.0	30.40	124.00	9.11	8.57	.	.	.	.	.	.	.	.
426		7	2.0	30.10	125.00	8.15	8.40	0.460	0.620	0.020	0.10	0.010	40.00	54.00	10.00
426		7	3.8	29.40	127.00	0.51	6.74	1.400	0.350	0.030	0.10	0.010	41.00	55.00	15.00
426		7	0.3	31.50	125.00	10.57	8.69	8.800	0.520	0.015	0.10	0.010	40.00	53.00	10.00
426		7	1.0	30.60	126.00	9.85	8.61	.	.	.	.	.	.	.	.
426		7	2.0	30.20	127.00	7.17	7.76	1.200	0.970	0.030	0.10	0.010	41.00	55.00	10.00
426		7	4.1	29.50	147.00	0.22	6.48	3.200	2.150	0.020	0.10	0.010	42.00	55.00	40.00
502		7	0.3	32.40	124.00	9.61	8.73	0.420	1.450	0.010	0.10	0.010	43.00	41.00	5.00
502		7	1.0	31.20	125.00	9.10	8.65	.	.	.	.	.	.	.	.
502		7	2.0	30.60	125.00	7.72	8.37	0.480	1.650	0.010	0.10	0.012	42.00	44.00	5.00
502		7	3.3	29.90	149.00	0.67	6.64	1.800	3.070	0.100	0.12	0.025	46.00	47.00	40.00
502		7	0.3	32.50	123.00	9.58	8.70	0.350	1.820	0.010	0.10	0.010	43.00	40.00	10.00
502		7	1.0	31.80	126.00	9.10	8.71	.	.	.	.	.	.	.	.
502		7	2.0	30.40	126.00	7.29	8.19	0.380	1.400	0.015	0.10	0.010	42.00	41.00	10.00
502		7	4.2	29.70	137.00	0.19	6.59	2.000	2.390	0.060	0.10	0.013	45.00	47.00	25.00
502	7		0.3	31.60	124.00	7.27	8.25	0.380	1.620	0.030	0.10	0.055	42.00	43.00	10.00
502	7		1.0	31.10	125.00	6.86	8.05	.	.	.	.	.	.	.	.
502	7		2.0	30.70	125.00	4.09	7.00	0.710	1.110	0.010	0.10	0.072	43.00	43.00	20.00
502	7		0.3	32.30	123.00	7.96	8.43	0.510	1.320	0.010	0.10	0.032	41.00	42.00	10.00
502	7		1.0	30.90	126.00	7.37	8.26	.	.	.	.	.	.	.	.
502	7		2.0	30.60	126.00	7.33	8.22	0.490	0.900	0.010	0.10	0.035	43.00	43.00	10.00
502	7		4.5	29.20	217.00	0.12	6.28	1.700	2.860	0.180	0.18	0.025	48.00	49.00	30.00
502	7		0.3	31.50	124.00	8.26	8.53	0.420	1.720	0.020	0.10	0.010	42.00	43.00	15.00
502	7		1.0	30.80	124.00	8.37	8.49	.	.	.	.	.	.	.	.
502	7		2.0	30.40	125.00	8.26	8.35	0.370	1.650	0.020	0.10	0.010	43.00	40.00	15.00
502	7		3.7	29.70	164.00	0.30	6.48	2.600	2.620	0.020	0.10	0.016	42.00	43.00	30.00
509		7	0.3	32.30	127.00	9.74	8.97	0.290	0.800	0.024	0.10	0.010	.	.	10.00
509		7	1.0	31.60	127.00	10.59	9.02	.	.	.	.	.	.	.	.
509		7	2.0	30.90	127.00	9.75	8.96	0.530	1.000	0.026	0.10	0.011	.	.	10.00
509		7	3.2	30.70	126.00	5.29	8.18	7.800	1.150	0.096	0.11	0.064	.	.	65.00
509		7	0.3	32.30	128.00	9.89	8.89	0.450	1.250	0.027	0.12	0.010	.	.	15.00
509		7	1.0	31.40	127.00	9.29	8.76	.	.	.	.	.	.	.	.
509		7	2.0	30.90	126.00	5.34	7.30	0.630	0.520	0.038	0.10	0.015	.	.	20.00
509		7	3.4	30.60	126.00	2.16	6.55	0.230	2.050	0.130	0.18	0.050	.	.	70.00
509	7		0.3	31.80	113.00	7.74	8.59	0.420	0.650	0.030	0.11	0.010	.	.	15.00
509	7		1.0	31.20	126.00	7.25	8.39	.	.	.	.	.	.	.	.
509	7		2.0	31.00	126.00	7.92	8.61	0.470	0.750	0.033	0.10	0.010	.	.	10.00
509	7		3.5	30.50	151.00	0.71	6.35	2.600	1.070	0.100	0.11	0.107	.	.	30.00
509	7		0.3	32.00	127.00	9.21	8.80	0.540	0.920	0.023	0.10	0.010	.	.	10.00
509	7		1.0	31.30	127.00	9.08	8.75	.	.	.	.	.	.	.	.
509	7		2.0	31.00	127.00	8.61	8.66	0.350	0.650	0.027	0.10	0.012	.	.	15.00
509	7		3.9	30.60	149.00	0.43	6.27	0.820	1.020	0.072	0.14	0.015	.	.	20.00
509	7		0.3	31.40	127.00	7.04	8.33	0.320	0.600	0.030	0.10	0.010	.	.	10.00
509	7		1.0	31.40	126.00	6.74	8.09	.	.	.	.	.	.	.	.
509	7		2.0	30.90	124.00	7.25	8.32	0.340	0.500	0.050	0.10	0.010	.	.	15.00
509	7		2.8	30.70	162.00	3.80	6.51	2.500	1.450	0.125	0.16	0.045	.	.	30.00
606		7	0.3	.	.	.	.	0.470	.	0.030	0.10	0.021	.	.	5.00
606		7	2.0	.	.	.	.	0.450	.	0.030	0.10	0.023	.	.	5.00
606		7	9.9	.	.	.	.	0.800	.	0.030	0.10	0.024	.	.	10.00
606	7		0.3	.	.	.	.	0.610	.	0.010	0.10	0.022	.	.	5.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
606	7		2.0	.	.	.	.	0.650	.	0.050	0.10	0.023	.	.	10.00
606	7		9.9	.	.	.	.	1.300	.	0.060	0.10	0.024	.	.	10.00
415		8	0.3	29.60	126.00	9.87	8.92	.	.	0.030	0.10	0.010	.	.	.
415		8	1.0	29.60	129.00	9.33	8.76	.	.	.	.	.	.	.	.
415		8	2.0	29.40	130.00	7.42	8.28	.	.	0.050	0.10	0.010	.	.	.
415		8	4.0	29.20	131.00	0.70	6.99	2.400	0.850	0.050	0.10	0.023	40.00	51.00	15.00
415		8	0.3	29.80	128.00	8.21	8.55	0.400	0.050	0.041	0.10	0.010	38.00	50.00	10.00
415		8	1.0	29.60	128.00	8.20	8.52	.	.	.	.	.	.	.	.
415		8	2.0	29.40	128.00	7.85	8.43	.	.	.	.	.	.	.	.
415		8	4.9	29.00	135.00	0.15	6.94	.	.	.	.	.	.	.	.
415		8	0.3	29.50	127.00	8.20	8.49	.	.	0.030	0.10	0.010	.	.	.
415		8	1.0	29.50	128.00	8.02	8.47	.	.	.	.	.	.	.	.
415		8	2.0	29.40	128.00	7.19	8.19	1.800	3.500	0.041	0.13	0.013	40.00	49.00	15.00
415		8	2.0	29.40	128.00	7.19	8.19	.	.	0.030	0.10	0.010	.	.	.
415		8	5.0	29.10	129.00	3.47	7.28	1.300	0.150	0.075	0.10	0.010	39.00	52.00	10.00
415		8	5.0	29.10	129.00	3.47	7.28	.	.	0.050	0.10	0.024	.	.	.
415		8	0.3	29.90	125.00	10.36	8.98	1.000	0.750	0.055	0.11	0.010	34.00	36.00	10.00
415		8	1.0	29.60	130.00	8.44	8.38	.	.	.	.	.	.	.	.
415		8	2.0	29.40	130.00	7.16	8.14	0.610	0.200	0.080	0.10	0.010	41.00	52.00	10.00
415		8	3.3	29.30	131.00	4.92	7.54	2.500	.	0.125	0.14	0.039	40.00	53.00	20.00
415	8		0.3	30.00	124.00	7.78	8.61	0.670	0.400	0.078	0.10	0.010	36.00	49.00	10.00
415	8		1.0	29.50	127.00	6.65	8.16	.	.	.	.	.	.	.	.
415	8		2.0	29.30	128.00	5.68	7.83	0.450	0.500	0.060	0.10	0.010	40.00	51.00	10.00
415	8		3.1	29.30	128.00	2.75	7.19	0.780	0.800	0.110	0.13	0.014	40.00	52.00	20.00
415	8		0.3	30.10	128.00	10.70	9.05	1.800	1.050	0.060	0.11	0.012	30.00	42.00	10.00
415	8		1.0	29.50	129.00	8.22	8.73	.	.	.	.	.	.	.	.
415	8		1.4	29.40	129.00	5.95	8.35	.	.	.	.	.	.	.	.
415	8		0.3	30.00	126.00	10.40	8.39	1.300	1.250	0.048	0.10	0.011	35.00	43.00	10.00
415	8		1.0	29.60	129.00	8.06	8.42	.	.	.	.	.	.	.	.
415	8		2.0	29.30	129.00	6.90	8.14	0.530	0.300	0.058	0.10	0.010	40.00	52.00	15.00
415	8		2.3	29.30	130.00	5.98	7.74	.	.	.	.	.	.	.	.
426		8	0.3	30.00	123.00	7.85	8.32	0.630	0.800	0.030	0.10	0.010	41.00	54.00	10.00
426		8	1.0	30.00	124.00	7.97	8.34	.	.	.	.	.	.	.	.
426		8	2.0	30.00	125.00	6.92	7.90	0.890	0.650	0.060	0.10	0.010	42.00	51.00	10.00
426		8	3.7	29.40	128.00	0.27	6.73	4.900	2.870	0.100	0.10	0.013	45.00	61.00	30.00
426		8	0.3	29.90	122.00	8.71	8.62	0.740	0.670	0.020	0.10	0.010	40.00	52.00	15.00
426		8	1.0	29.90	123.00	8.58	8.61	.	.	.	.	.	.	.	.
426		8	2.0	29.90	123.00	8.58	8.62	0.960	0.720	0.020	0.10	0.010	38.00	50.00	10.00
426		8	5.0	29.10	127.00	0.56	6.70	1.600	1.200	0.030	0.10	0.010	40.00	55.00	25.00
426		8	0.3	30.00	123.00	7.41	8.09	0.790	0.270	0.040	0.10	0.010	41.00	54.00	10.00
426		8	1.0	30.00	125.00	7.34	8.07	.	.	.	.	.	.	.	.
426		8	2.0	29.90	126.00	7.12	8.02	3.200	0.720	0.060	0.10	0.010	44.00	58.00	10.00
426		8	5.6	29.00	129.00	0.79	6.90	0.960	0.670	0.050	0.10	0.010	40.00	54.00	35.00
426		8	0.3	30.10	126.00	9.02	8.50	0.460	0.400	0.030	0.10	0.010	42.00	51.00	15.00
426		8	1.0	30.00	125.00	7.61	8.16	.	.	.	.	.	.	.	.
426		8	2.9	30.00	125.00	7.14	8.03	0.640	0.650	0.030	0.10	0.010	41.00	56.00	10.00
426		8	3.5	29.60	126.00	1.05	6.85	0.690	0.620	0.040	0.10	0.010	42.00	56.00	10.00
426	8		0.3	30.00	123.00	8.30	8.50	0.750	0.950	0.015	0.10	0.010	40.00	51.00	15.00
426	8		1.0	30.00	124.00	7.87	8.42	.	.	.	.	.	.	.	.
426	8		2.0	30.00	124.00	7.38	8.33	0.760	0.520	0.015	0.10	0.010	39.00	50.00	10.00
426	8		4.0	29.40	129.00	0.27	6.66	2.700	2.300	0.030	0.10	0.011	43.00	52.00	25.00
426	8		0.3	30.10	124.00	8.15	8.56	3.400	1.570	0.060	0.10	0.010	42.00	52.00	20.00
426	8		1.0	30.10	124.00	7.66	8.49	.	.	.	.	.	.	.	.
426	8		2.0	.	.	.	.	27.000	1.570	0.080	0.10	0.013	43.00	51.00	65.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
426	8		1.7	30.00	124.00	6.58	8.08	.	.	.	.	.	.	.	.
426	8		0.3	29.90	123.00	8.03	8.60	2.400	0.720	0.020	0.12	0.010	38.00	49.00	20.00
426	8		1.0	30.00	123.00	8.04	8.59	.	.	.	.	.	.	.	.
426	8		2.0	.	.	.	.	8.500	3.050	0.050	0.10	0.011	40.00	53.00	10.00
426	8		1.6	30.00	123.00	7.23	8.36	.	.	.	.	.	.	.	.
430		8	0.3	30.50	127.00	7.01	8.07	0.630	0.970	0.020	0.14	0.010	41.00	53.00	15.00
430		8	1.0	29.80	128.00	7.51	8.22	.	.	.	.	.	.	.	.
430		8	2.0	29.50	129.00	5.53	7.57	0.850	0.870	0.010	0.13	0.010	39.00	54.00	20.00
430		8	4.0	29.30	129.00	2.47	6.97	2.700	0.600	0.015	0.12	0.010	40.00	52.00	10.00
430		8	0.3	29.80	130.00	5.63	7.63	0.520	0.550	0.010	0.15	0.010	42.00	53.00	10.00
430		8	1.0	29.60	131.00	5.51	7.55	.	.	.	.	.	.	.	.
430		8	2.0	29.40	130.00	5.36	7.53	0.550	0.220	0.020	0.10	0.010	40.00	56.00	15.00
430		8	6.3	28.50	148.00	0.08	6.69	9.700	6.450	0.400	0.38	0.036	47.00	64.00	60.00
430		8	0.3	29.90	151.00	6.34	7.77	0.780	6.920	0.010	0.10	0.010	42.00	53.00	10.00
430		8	1.0	29.60	131.00	6.00	7.64	.	.	.	.	.	.	.	.
430		8	2.0	29.40	131.00	4.75	7.35	0.640	1.250	0.010	0.14	0.010	40.00	57.00	15.00
430		8	5.6	29.20	129.00	2.33	7.08	1.800	1.170	0.015	0.10	0.014	40.00	55.00	10.00
430		8	0.3	30.40	128.00	9.02	8.65	1.100	1.340	0.020	0.10	0.010	40.00	52.00	15.00
430		8	1.0	29.90	129.00	7.62	8.28	.	.	.	.	.	.	.	.
430		8	2.0	29.40	129.00	6.08	7.68	0.740	0.550	0.020	0.10	0.010	38.00	55.00	5.00
430		8	4.5	29.30	138.00	3.23	6.92	1.400	1.700	0.040	0.14	0.013	41.00	57.00	15.00
430	8		0.3	29.70	141.00	6.26	7.72	1.200	1.170	0.010	0.10	0.010	41.00	52.00	15.00
430	8		1.0	29.30	139.00	5.42	7.40	.	.	.	.	.	.	.	.
430	8		2.0	29.20	138.00	5.20	7.36	0.880	0.500	0.020	0.10	0.010	40.00	55.00	10.00
430	8		4.3	29.20	172.00	3.69	6.77	1.400	1.170	0.020	0.10	0.010	40.00	55.00	15.00
430	8		0.3	30.00	132.00	6.65	7.86	0.960	1.070	0.040	0.14	0.010	41.00	57.00	15.00
430	8		1.0	29.50	132.00	4.92	7.43	.	.	.	.	.	.	.	.
430	8		2.0	29.30	131.00	4.70	7.42	0.680	1.100	0.030	0.10	0.010	42.00	55.00	10.00
430	8		3.1	29.10	133.00	3.41	7.22	0.740	0.800	0.020	0.12	0.010	41.00	55.00	10.00
430	8		0.3	29.70	131.00	6.60	8.08	1.000	1.650	0.020	0.10	0.026	41.00	52.00	10.00
430	8		1.0	29.40	130.00	6.17	7.95	.	.	.	.	.	.	.	.
430	8		2.0	29.30	130.00	4.33	7.32	1.200	0.950	0.020	0.10	0.010	38.00	55.00	10.00
508		8	0.3	31.10	129.00	9.82	8.94	0.350	0.070	0.012	0.10	0.010	.	.	10.00
508		8	1.0	31.00	129.00	10.01	8.98	.	.	.	.	.	.	.	.
508		8	2.0	30.70	128.00	9.29	8.89	0.480	0.370	0.017	0.10	0.010	.	.	15.00
508		8	3.4	30.40	134.00	3.42	7.20	0.630	0.450	0.073	0.10	0.011	.	.	20.00
508		8	0.3	30.70	146.00	8.01	8.52	0.340	0.660	0.022	0.10	0.010	.	.	10.00
508		8	1.0	30.70	140.00	7.81	8.51	.	.	.	.	.	.	.	.
508		8	2.0	30.60	139.00	7.06	8.34	0.340	0.300	0.028	0.10	0.010	.	.	10.00
508		8	5.2	30.20	138.00	0.63	6.80	0.350	0.660	0.038	0.10	0.010	.	.	15.00
508		8	0.3	31.00	131.00	8.15	8.68	0.250	0.350	0.011	0.10	0.010	.	.	10.00
508		8	1.0	30.80	131.00	7.77	8.61	.	.	.	.	.	.	.	.
508		8	2.0	30.70	131.00	7.22	8.37	0.540	1.500	0.044	0.10	0.010	.	.	20.00
508		8	5.5	30.20	133.00	0.81	6.95	2.300	0.700	0.049	0.10	0.015	.	.	30.00
508		8	0.3	31.60	130.00	9.10	8.71	0.460	1.170	0.015	0.10	0.013	.	.	10.00
508		8	1.0	30.90	131.00	8.00	8.57	.	.	.	.	.	.	.	.
508		8	2.0	30.70	131.00	7.82	8.53	0.660	1.050	0.024	0.10	0.010	.	.	15.00
508		8	5.0	30.10	140.00	2.01	6.88	1.000	1.070	0.053	0.10	0.038	.	.	20.00
508	8		0.3	31.70	128.00	10.07	9.03	0.390	0.100	0.010	0.10	0.010	.	.	15.00
508	8		1.0	30.90	128.00	8.72	8.85	.	.	.	.	.	.	.	.
508	8		1.7	30.80	128.00	5.34	7.72	.	.	.	.	.	.	.	.
508	8		0.3	31.60	129.00	11.11	9.19	0.410	0.300	0.015	0.10	0.010	.	.	10.00
508	8		1.0	31.00	127.00	9.49	9.03	.	.	.	.	.	.	.	.
508	8		2.0	30.80	127.00	6.38	8.38	0.410	0.470	0.036	0.10	0.010	.	.	15.00

DATE	TREATMENT	BUFFER	DEPTH	TEMP	COND	DO	PH	TURBID	BOD5	NH3-N	TKN	TOT-P	HARD	ALK	COLOR
508	B		2.9	30.60	151.00	0.29	6.62	5.200	2.150	0.067	0.10	0.015	.	.	60.00
508	B		0.3	31.40	129.00	11.50	9.19	0.360	0.300	0.020	0.10	0.010	.	.	10.00
508	B		1.0	31.00	128.00	9.72	9.01	.	.	.	.	.	.	.	.
508	B		2.0	.	.	.	.	8.400	1.560	0.100	0.10	0.017	.	.	60.00
508	B		1.8	30.70	134.00	5.46	7.10	.	.	.	.	.	.	.	.
515		B	0.3	31.10	125.00	7.51	8.23	0.530	0.500	.	0.10	0.010	.	.	15.00
515		B	1.0	30.50	126.00	7.03	8.27	.	.	.	.	.	.	.	.
515		B	2.0	30.10	127.00	5.67	7.68	0.510	0.200	.	0.10	0.010	.	.	10.00
515		B	3.7	29.90	131.00	2.93	6.63	0.620	0.720	.	0.10	0.016	.	.	20.00
515		B	0.3	30.20	129.00	4.79	7.23	0.650	0.450	0.060	0.10	0.010	.	.	10.00
515		B	1.0	30.20	130.00	4.60	7.15	.	.	.	.	.	.	.	.
515		B	2.0	30.00	130.00	4.37	7.11	0.630	0.600	0.060	0.10	0.014	.	.	15.00
515		B	5.7	29.80	126.00	3.46	7.09	0.740	1.250	0.100	0.10	0.010	.	.	20.00
515		B	0.3	30.70	126.00	6.16	7.76	0.520	0.550	0.080	0.10	0.010	.	.	10.00
515		B	1.0	30.30	129.00	5.84	7.47	.	.	.	.	.	.	.	.
515		B	2.0	30.10	130.00	4.07	7.10	0.510	0.300	0.060	0.10	0.010	.	.	15.00
515		B	5.4	29.80	129.00	2.40	6.92	1.600	0.350	0.030	0.10	0.048	.	.	20.00
515		B	0.3	31.60	128.00	7.43	8.23	0.860	0.750	0.120	0.10	0.015	.	.	15.00
515		B	1.0	30.50	128.00	6.03	7.67	.	.	.	.	.	.	.	.
515		B	2.0	30.20	128.00	4.19	7.15	0.770	0.500	0.040	0.10	0.020	.	.	20.00
515		B	5.3	30.00	136.00	2.90	6.92	0.810	0.520	.	0.10	0.018	.	.	10.00
515	B		0.3	30.50	128.00	7.32	8.25	0.570	0.400	.	0.10	0.012	.	.	10.00
515	B		1.0	30.40	128.00	6.89	8.20	.	.	.	.	.	.	.	.
515	B		2.0	30.00	128.00	6.02	8.04	0.430	0.350	.	0.10	0.012	.	.	15.00
515	B		2.6	29.90	131.00	3.50	6.99	0.690	0.600	.	0.10	0.015	.	.	10.00
515	B		0.3	30.20	135.00	6.11	7.47	0.570	0.400	.	0.10	0.013	.	.	15.00
515	B		1.0	30.10	134.00	4.02	7.00	.	.	.	.	.	.	.	.
515	B		2.0	30.00	134.00	3.15	6.89	0.510	0.350	.	0.10	0.010	.	.	15.00
515	B		3.4	29.90	134.00	2.96	6.82	1.000	0.320	.	0.10	0.017	.	.	20.00
515	B		0.3	30.20	129.00	6.42	8.06	0.520	0.600	.	0.10	0.010	.	.	10.00
515	B		1.0	30.30	130.00	5.55	7.66	.	.	.	.	.	.	.	.
515	B		2.0	30.10	130.00	4.14	7.16	0.480	0.200	.	0.10	0.013	.	.	15.00
515	B		5.5	29.90	146.00	0.71	6.65	0.970	0.550	.	0.10	0.013	.	.	20.00
515	B		4.0	29.90	129.00	3.26	7.03	0.970	0.550	.	0.10	0.013	.	.	20.00
515	B		3.0	30.00	130.00	3.16	7.05	0.970	0.550	.	0.10	0.013	.	.	20.00
605		B	0.3	.	.	.	.	0.400	.	0.010	0.10	0.020	.	.	5.00
605		B	2.0	.	.	.	.	0.420	.	0.020	0.10	0.022	.	.	50.00
605		B	9.9	.	.	.	.	1.800	.	0.020	0.10	0.023	.	.	15.00
605	B		0.3	.	.	.	.	0.430	.	0.010	0.10	0.021	.	.	5.00
605	B		2.0	.	.	.	.	0.410	.	0.010	0.10	0.024	.	.	5.00
605	B		9.9	.	.	.	.	0.920	.	0.030	0.10	0.026	.	.	10.00

APPENDIX E: TAXONOMIC ANALYSIS OF HORIZONTALLY COMPOSITED ALGAL SAMPLES BY DEPTH AND TIME

Taxonomic Analysis of Horizontally Composited Algal Samples by Depth* and Time**

Taxon	Date 4-12	4-20	4-23	4-26	5-10	6-08
		TRT-1				
Chlorophyceae						
Flagellates						
Eudorina				2 b		
Pleodorina						
Volvox	s	s	s		s 2 b	s
Coccoids						
Botryococcus	s	s	s 2	s 2 b	s 2	
Characium						
Coelastrum						
Dimorphococcus		s	s 2 b	s 2 b	b	
Elaktothrix						
Gloeocystis	s 2	s 2 b	s 2 b	s 2 b		
Oocystis			2	2 b		
Pediastrum						
Planktosphaeria			s 2 b	2	b	
Filaments						
Bulbochaete		b	2			
Chaetophora						
Coleochaete						
Oedogonium	s 2 b	s	2 b	2 b	b	b
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus	2	b	2 b	s 2 b	s b	
Closterium	2	b	2 b	2 b	s b	
Cosmarium	s 2	s 2	s 2 b	s 2 b	s 2 b	s 2 b
Clyindrocystis						
Desmidium	s 2 b	s 2	s 2	s 2 b	s 2 b	s 2 b
Euastrum						
Gonatozygon	s 2	s 2	2	s 2	b	s b
Hyalotheca	s 2	s	b	2	s 2 b	s b
Micrasterias	s 2 b	s 2 b	s 2 b	s 2 b	s 2	2 b
Phymatodocis						
Pleurotaenia	s 2	s b		b	b	b
Sphaerozosma			2 b			
Spondylosium	s	s 2	2	s 2 b	s b	
Staurastrum	s b	s 2 b	s 2 b	s 2 b	s 2 b	s b
Xanthidium			2			

(Continued)

* Depth notations: s = 0.3 m, 2 = 2 m, b = supra-bottom.
** Time: First date = pretreatment, second date = day 1 posttreatment.

Taxon	4-12	4-20	4-23	4-26	5-10	6-08
	TRT-1 (Continued)					
Filaments						
Mougeotia	s	s				
Spirogyra		s		2 b	b	b
Zygnema	s	2	2	b		
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium	s b	s 2 b	2 b	s 2	s 2 b	
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes		s				
Cymbella						
Eunotia						
Epithemia	s 2 b	b	2 b			
Fragilaria		2 b	2 b	2	b	
Gomphonema		s 2				
Melosira			2			
Navicula	s b	s 2	2 b	2		
Nitzschia						
Phopolodia	s b	2				
Synedra	s 2 b	2 b	2	2 b	s b	
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium			s			
Microcystis	s 2 b	s		s 2 b	b	
Filaments						
Anabaena						
Arthrospira						
Calothrix		b	2			
Lyngbya	2	b	s 2 b	s 2	s b	
Oscillatoria	s 2 b	s 2 b	s 2 b	s 2 b	s b	
Schizothrix						
Tolypothrix	s 2 b	s b	s 2 b	s 2 b	b	

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
		TRT-2				
Chlorophyceae						
Flagellates						
Eudorina				s 2	s 2	
Pleodorina			s			
Volvox	s		s	s	s 2 b	s 2 b
Coccoids						
Botryococcus		s 2	s	s	s	s
Characium						
Coelastrum						
Dimorphococcus			s	s	s 2	
Elaktothrix						
Gloeocystis	s 2 b	s 2	s 2 b	s 2 b		2
Oocystis	s b	s	s 2	s 2	s 2	
Pediastrum			s 2 b	s 2 b	s 2	
Planktosphaeria						
Filaments						
Bulbochaete	s 2					
Chaetophora						
Coleochaete	s					
Oedogonium	s 2 b	s b	s 2	s	s	
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus			s			
Closterium	s					b
Cosmarium	s	s	s 2 b	s 2 b	s 2 b	s 2 b
Clyindrocystis						
Desmidium	s 2	s 2 b	s 2 b	s	s 2 b	b
Euastrum						
Gonatozygon			s		s 2 b	b
Hyalotheca			s		s b	b
Micrasterias	s 2	s 2 b	s 2 b	s 2 b	b	2 b
Phymatodocis						
Pleurotaenia	s	s 2			s b	b
Sphaerozosma						
Spondylosium	2	s 2	s 2	2 b	s b	
Staurastrum	s	s 2 b	s 2	s	s 2 b	s 2 b
Xanthidium						

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
	TRT-2 (Continued)					
Filaments						
Mougeotia			s b	s		
Spirogyra	s 2					
Zygnema	2	2				
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium	s 2 b	2	s 2	2	2 b	2 b
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes	2	2 b	s		2 b	
Cymbella		2				
Eunotia				b		
Epithemia	b		2			
Fragilaria						
Gomphonema						
Melosira		2				
Navicula	b	b	2	s 2 b	b	
Nitzschia						
Phopolodia			2 b		s	
Synedra	2	s b				
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium		s		s		
Microcystis	2 b	s	s	s 2 b	s	
Filaments						
Anabaena			2			
Arthrospira						
Calothrix	b	2		2		
Lyngbya	s 2 b	2	2	s 2 b	s 2 b	s 2
Oscillatoria	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b	s
Schizothrix						
Tolypothrix						

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
		TRT-3				
Chlorophyceae						
Flagellates						
Eudorina					s	s
Pleodorina				s	s	
Volvox					2	s 2 b
Coccoids						
Botryococcus		s 2	2		s	s 2 b
Characium		s				
Coelastrum						
Dimorphococcus					s	s 2
Elaktothrix			s			
Gloeocystis		s 2	s b	s	2 b	
Oocystis	2	s 2	s		s	
Pediastrum	2	b	s			
Planktosphaeria			s	s	s	2
Filaments						
Bulbochaete	2	s	s		s	s
Chaetophora						
Coleochaete		s	s b			
Oedogonium	s 2 b	s 2 b	s 2	s 2 b	s 2 b	s 2 b
Ulothrix					2	2
Conjugatophyceae						
Desmids						
Arthorodesmus			2	2	s 2	s 2
Closterium		2		s	s b	2
Cosmarium	s 2	s 2 b	s 2	s 2	s 2	s 2
Clyindrocystis						
Desmidium	s	s 2 b	s 2		s 2 b	s 2 b
Euastrum						
Gonatozygon		b	2 b	s 2 b	s 2 b	s 2 b
Hyalotheca		s	s		2	s 2 b
Micrasterias	s 2 b	s 2 b	s 2 b	s 2	s 2 b	s 2 b
Phymatodocis						
Pleurotaenia	s	s 2 b	s		b	s 2 b
Sphaerozosma						
Spondylosium						
Staurastrum	s 2 b	s 2 b	s 2	s 2 b	s 2 b	s 2 b
Xanthidium						

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
	TRT-3 (Continued)					
Filaments						
Mougeotia		s 2 b	s 2	s 2		
Spirogyra		b				b
Zygnema		s				b
Euglenophyceae						
Euglena	2					
Pyrrhophyceae						
Ceratium	2	2 b		s 2 b	2 b	
Peridinium						
Stylodinium		s 2				
Bacillariophyceae						
Achnanthes	s	s b	b	2 b	b	
Cymbella	s 2	2		2	s	
Eunotia		2				
Epithemia	s b	s	s 2		s 2	
Fragilaria		2 b		2		
Gomphonema						
Melosira		2	b	2 b		
Navicula		s 2	2 b		2	
Nitzschia		s				
Phopolodia	2	s				
Synedra	s 2 b	s 2 b	s 2 b	s 2	s 2 b	
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium					b	
Microcystis		s	s	s 2 b	s 2	
Filaments						
Anabaena	s					
Arthrospira						
Calothrix	2	s	b			
Lyngbya	s 2	s 2 b	s 2 b	s 2 b	s 2	
Oscillatoria	2 b	s 2 b	s 2 b	s 2 b	s 2	
Schizothrix	2	s 2 b	b	2 b	s 2 b	
Tolypothrix						

(Continued)

Taxon	Date 4-14	4-21	4-25	4-28	5-12	6-08
		REF-4				
Chlorophyceae						
Flagellates						
Eudorina			2	2		
Pleodorina	s		s 2 b			
Volvox	s		s 2 b	s 2 b	s 2 b	s 2 b
Coccoids						
Botryococcus		s 2			s	s 2 b
Characium						
Coelastrum						
Dimorphococcus		2		s b	s 2	s
Elaktothrix						
Gloeocystis	s 2	2		s 2 b	s 2 b	2 b
Oocystis	s	2		b	s 2	s 2 b
Pediastrum	b	s	b		b	2
Planktosphaeria		2		s 2 b	2	s 2
Filaments						
Bulbochaete	s			2 b		s
Chaetophora				2		
Coleochaete						
Oedogonium	s 2 b	s 2 b	s b	s 2 b	s 2 b	s b
Ulothrix						2
Conjugatophyceae						
Desmids						
Arthorodesmus					s 2	s 2 b
Closterium		2				2
Cosmarium	s 2	s 2	s 2	s 2	s 2	2
Clyindrocystis		2				
Desmidium	s 2	s 2	b	s 2 b	s 2	s 2 b
Euastrum						
Gonatozygon	s 2	s 2	s 2	s 2 b	s 2 b	s 2 b
Hyalotheca				s	s 2	s 2 b
Micrasterias	s 2	s 2 b	s 2	s 2 b	s 2 b	s 2 b
Phymatodocis						b
Pleurotaenia		2	s 2	2 b	s 2	s 2 b
Sphaerozosma						2 b
Spondylosium	2	s 2	2	s 2 b	s 2	s 2 b
Staurastrum	s	s 2 b	s 2 b	s b	s 2 b	s 2 b
Xanthidium				2		

(Continued)

Taxon	4-14	4-19	4-21	4-25	5-09	6-09
	REF-4 (Continued)					
Filaments						
Mougeotia		s b		s	s	2 b
Spirogyra	s		s 2 b	s	2	
Zygnema				b		
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium	s	s 2		2 b	2	
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes	2	b			2	
Cymbella		s	b			
Eunotia						
Epithemia	s 2	s b	b	2 b	2 b	s
Fragilaria	s			2		
Gomphonema						
Melosira	s		2 b	2		
Navicula			2	2		s
Nitzschia						
Phopolodia		2	s	b	2	s
Synedra	s 2 b	s 2 b	s 2 b	s 2 b	s b	
Terpsinoe					b	
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium			2	2		
Microcystis		s 2 b	s 2	s 2	s	
Filaments						
Anabaena	b	s b		s	s	
Arthrospira						
Calothrix				s 2	b	
Lyngbya	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b	
Oscillatoria	s 2 b	2	s 2 b	s 2 b	s 2 b	
Schizothrix	2		s 2 b		s	
Tolypothrix		b	2	s b	s b	

(Continued)

Taxon	Date 4-12	4-20	4-23	4-26	5-10	6-08
		TRT-5				
Chlorophyceae						
Flagellates						
Eudorina			2			
Pleodorina						
Volvox		2	2	s 2 b	2	2 b
Coccoids						
Botryococcus	s		2 b	s		
Characium		s				
Coelastrum						
Dimorphococcus						
Elaktothrix						
Gloeocystis	s 2	s 2 b	s 2 b	b		b
Oocystis	s 2	s 2 b	b			
Pediastrum	b	s 2 b	b			
Planktosphaeria					b	
Filaments						
Bulbochaete		2		b		
Chaetophora						
Coleochaete	s 2		b			
Oedogonium	s 2 b	s 2	b		2 b	2 b
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus	2	2	2	s	2 b	b
Closterium		2				
Cosmarium	s 2	s 2	s 2	2 b	s 2 b	
Clyindrocystis						
Desmidium	s 2	s 2	s 2	s 2 b	2 b	2 b
Euastrum						
Gonatozygon	s 2 b	s 2 b	b	2 b	b	b
Hyalotheca		s 2		b	b	2 b
Micrasterias	s 2	s 2 b	b	b	2 b	2 b
Phymatodocis						
Pleurotaenia			2	s		2 b
Sphaerozosma				2		
Spondylosium				b	2	2
Staurastrum	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b
Xanthidium						

(Continued)

Taxon	4-12	4-20	4-23	4-26	5-10	6-08
	TRT-5 (Continued)					
Filaments						
Mougeotia	s 2	b				
Spirogyra	s	s	b			
Zygnema	s					
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium		s 2 b	2 b	s 2		
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes	s 2	s b	2	b	b	
Cymbella						
Eunotia		b				
Epithemia	s b	s b	b	s b		
Fragilaria	s		b	s b		
Gomphonema		s				
Melosira	2 b	2 b	b	b		2
Navicula			s			
Nitzschia						
Phopolodia	2		s	b	b	2
Synedra	s 2 b	s		b		
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium			s 2			
Microcystis	2 b	s 2 b	2 b	2 b	2	2
Filaments						
Anabaena	s	2				s
Arthrospira						
Calothrix						
Lyngbya	s 2 b	s 2 b	s 2 b	b	b	
Oscillatoria	s 2 b	s 2 b	s 2 b	s 2 b	2 b	s 2
Schizothrix						
Tolypothrix	s 2 b	2 b	2 b	s	b	

(Continued)

Taxon	4-12	4-20	4-23	4-26	5-10	6-08
		TRT-6				
Chlorophyceae						
Flagellates						
Eudorina			s	2	s	
Pleodorina						
Volvox	s 2	s	s 2	2 b	s 2 b	b
Coccoids						
Botryococcus	s 2	s	s 2	2	2 b	s
Characium						
Coelastrum						
Dimorphococcus		s 2		2	b	2
Elaktothrix						
Gloeocystis	s 2	s 2 b	s b	2 b		b
Oocystis	s 2	s	s			b
Pediastrum	2 b		b		b	b
Planktosphaeria			s 2 b		b	b
Filaments						
Bulbochaete						
Chaetophora						
Coleochaete						
Oedogonium	2 b		s 2 b	2		b
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus	s 2 b	2	s 2	s 2	s 2 b	2
Closterium	b				b	
Cosmarium	s 2	s 2 b	s b	s 2 b	2	s 2 b
Clyindrocystis						
Desmidium	s 2 b	s 2 b	s 2 b	s 2	s 2 b	2 b
Euastrum						
Gonatozygon	s 2		s	2	b	2 b
Hyalotheca	s b		2		2	s 2 b
Micrasterias	s 2 b	b	s 2	s 2 b	b	b
Phymatodocis						
Pleurotaenia	2	b			b	b
Sphaerozosma	s					
Spondylosium	s 2		s	2	b	s
Staurastrum	s 2	s	s 2	s 2 b	s 2 b	s 2 b
Xanthidium						

(Continued)

Taxon	4-12	4-20	4-23	4-26	5-10	6-08
	TRT-6 (Continued)					
Filaments						
Mougeotia	s			2		b
Spirogyra	2			2 b	b	
Zygnema	s					
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium	s		s 2 b			2
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes	b				b	
Cymbella						
Eunotia						
Epithemia	b		s		b	s
Fragilaria	s 2 b	2	b		b	
Gomphonema		s 2				
Melosira	s 2 b		b	b	b	s
Navicula	s 2	2 b	s 2			
Nitzschia						
Phopolodia	2	s 2	s		b	
Synedra						
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece						
Coelosphaerium			2			
Microcystis	s b	s	s b	2 b	s 2 b	s
Filaments						
Anabaena		s 2	s			
Arthrospira						
Calothrix	s	2 b		2		
Lyngbya	s 2 b	s b	2 b	s b	b	s
Oscillatoria	s 2 b	s 2 b	s b	s 2 b	b	s
Schizothrix		s				
Tolypothrix	b	s 2 b	s b	b	b	

(Continued)

Taxon	Date 4-15	4-19	4-21	4-25	5-09	6-08
		TRT-7				
Chlorophyceae						
Flagellates						
Eudorina						
Pleodorina						
Volvox	s	s	s 2		s 2	
Coccoids						
Botryococcus	s 2 b	s 2	s 2 b	s 2	s 2	b
Characium						
Coelastrum						
Dimorphococcus			2			
Elaktothrix						
Gloeocystis	s 2 b	s 2 b	s 2	s 2 b	2 b	b
Oocystis	s 2	s	s 2 b	s 2 b	s b	s
Pediastrum	b		s 2 b	b	s b	
Planktosphaeria			s 2		s 2 b	
Filaments						
Bulbochaete		2				
Chaetophora						
Coleochaete						
Oedogonium	s 2	s 2	s 2	s 2	2 b	b
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus	s	2	s 2 b		s b	
Closterium						b
Cosmarium	s 2	s 2 b	s 2		s 2 b	
Clyindrocystis						
Desmidium	s 2 b	2 b	s 2 b	2 b	s 2 b	2
Euastrum	2					
Gonatozygon	s 2 b	s 2	s			
Hyalotheca		2	2 b			b
Micrasterias	s	s 2	s 2 b	2 b	s 2 b	b
Phymatodocis			2		2	b
Pleurotaenia		2			2	b
Sphaerozosma						
Spondylosium	s 2	2	s b	2	s 2 b	s
Staurastrum	s 2	s 2 b	s 2 b	s 2 b	s 2	s 2 b
Xanthidium						

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
	TRT-7 (Continued)					
Filaments						
Mougeotia		2 b		2		
Spirogyra		s				
Zygnema						
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium						
Peridinium						
Stylodinium						
Bacillariophyceae						
Achnanthes	2		s			
Cymbella						
Eunotia						
Epithemia	s					
Fragilaria		2				
Gomphonema						
Melosira			2 b		b	
Navicula					b	s
Nitzschia						
Phopolodia	s b	s b	s	2		
Synedra						
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece			s 2			
Coelosphaerium	2		2		b	
Microcystis	s 2 b	s 2 b	s 2 b	2 b	s b	s 2
Filaments						
Anabaena	b					
Arthrospira				s b	b	
Calothrix			2			
Lyngbya	s 2	s 2		2		
Oscillatoria	s 2 b	s 2	s 2 b	s b	s 2 b	s 2
Schizothrix						
Tolypothrix						

(Continued)

Taxon	Date 4-15	4-23	4-26	4-30	5-14	6-08
		REF-8				
Chlorophyceae						
Flagellates						
Eudorina	b	2	s	s 2		s
Pleodorina		2				
Volvox	b	s	s b	s 2	s 2 b	2
Coccoids						
Botryococcus	s b	s 2	s	s 2	s 2 b	s
Characium				b		
Coelastrum					2	
Dimorphococcus		2		2	2	
Elaktothrix						
Gloeocystis	s 2 b	s 2 b	s b	s 2 b	s 2 b	s 2 b
Oocystis	s 2 b	s 2	s b	s 2 b	s 2 b	s 2 b
Pediastrum	s	2	b	2 b	s b	b
Planktosphaeria	b	s 2 b	b	s 2 b	2 b	
Filaments						
Bulbochaete		2		2 b	2 b	
Chaetophora						
Coleochaete	s		b	2 b		s
Oedogonium	s 2 b	s 2	s b	s 2 b	s 2	
Ulothrix						
Conjugatophyceae						
Desmids						
Arthorodesmus		s 2		s 2 b	s 2 b	s
Closterium		2		b		
Cosmarium	s 2 b	s 2 b	s b	s b	s 2 b	s 2 b
Clyindrocystis						
Desmidium	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b	s 2 b
Euastrum			s			
Gonatozygon	2 b	2	b	2	s 2 b	
Hyalotheca	b	2 b			b	
Micrasterias	2 b	s 2 b	b	s 2 b	s 2 b	s
Phymatodocis				b		
Pleurotaenia	s 2	b		s 2		
Sphaerozosma		2				
Spondylosium				s b	s	s
Staurastrum	s 2 b	s 2 b	s 2 b	2	s 2 b	s 2 b
Xanthidium			b			

(Continued)

Taxon	Date 4-14	4-19	4-21	4-25	5-09	6-09
	REF-8 (Continued)					
Filaments						
Mougeotia	2 b	s 2 b	b	s b		
Spirogyra						
Zygnema	a b	s 2 b	s	s b		
Euglenophyceae						
Euglena						
Pyrrhophyceae						
Ceratium					2	
Peridinium	2 b					
Stylodinium						
Bacillariophyceae						
Achnanthes	2 b	2			2	
Cymbella	2					
Eunotia						
Epithemia		s b			b	
Fragilaria		2	b	b	2	
Gomphonema						
Melosira	s	2 b				
Navicula	s 2	s 2			2 b	
Nitzschia	s					
Phopolodia	b	s 2	b	2	2 b	s
Synedra	s 2 b	2 b		s b	b	
Terpsinoe						
Cyanophyceae						
Coccoid						
Aphanothece				2 b	b	
Coelosphaerium					s b	
Microcystis	s 2 b	s 2 b	s 2 b	s 2	2 b	s
Filaments						
Anabaena	s 2 b	s 2 b		s 2	s 2 b	s
Arthrospira						
Calothrix	b		s	s b	s 2 b	s
Lyngbya	2 b	2	2 b	s 2 b	s 2	s
Oscillatoria	s 2 b	b	s 2 b	s 2 b	s 2	s
Schizothrix	s b	s 2 b		b		
Tolypothrix			s	b		2

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Westerdahl, Howard E.
Field evaluation of two endothall formulations for managing hydrilla in Gatun Lake, Panama / by Howard E. Westerdahl (Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station). -- Vicksburg, Miss. : The Station ; Springfield, Va. : available from NTIS, 1983.
171 p. in various pagings : ill. ; 27 cm. -- (Technical report ; A-83-3)
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Final report.
"Prepared for Panama Canal Commission."
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Bibliography: p. 81-83.

1. Aquatic plants. 2. Aquatic weeds. 3. Herbicides. 4. Gatun Lake (Panama). 5. Panama Canal. I. United States. Panama Canal Commission. II. Aquatic Plant Control Research Program. III. Title IV. Series:

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Field evaluation of two endothall formulations : ... 1983.
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