INTERIM

PROJECT STATUS

Wisconsin Lake Management Planning Grant

for the

FORESTVILLE MILLPOND

January 5, 1996

Prepared by:
Door County Soil and Water
Conservation Department

Submitted to:
Door County Airport and Parks Committee

Inventory Status

1. **Millpond and Tributary Water Chemistry**

Four sample sites (F1, F2, F3 & F4) were selected to represent water flowing into and out of the Millpond (see Attachment 1.0). Site F1 is located in the deepest area of the Millpond, and is just above the dam. Site F2 was located where the Ahnapee River entered the millpond. Site F2 was later discarded from the sampling schedule because of poor accessibility and repetitive analysis of water entering the millpond. Site F3 is located at the intersection of County Highway H and the Ahnapee River. Site F4 is located 0.7 miles east of site F3 where an unnamed tributary to the Ahnapee intersects County Highway H. Refer to attachment 1 for test site locations.

Water sampling was conducted once a month with additional sampling after holidays and major rainfall ($\geq 0.5"$). Sampling was sometimes limited because of low flow rates at site F4 and frozen conditions at all sites. Water quality parameters, sampling dates and results are summarized in water sample site tables F1, F2, F3 and F4. See attachment 1.

Water Chemistry Results

A) Dissolved Oxygen: Dissolved oxygen (D.O.) is the most important parameter for the survival of aquatic organisms. Levels below 5.0 ppm (mg/L) will stress and kill some fish species. Low D.O. levels also trigger the release of sediment held phosphorus, which in turn promotes summer algae blooms. Oxygen is produced when green aquatic plants grow in sunlight through a process called photosynthesis. When aquatic plants are not exposed to sunlight (nighttime, turbid or snow and ice covered conditions), carbon dioxide is produced and oxygen is used in a process called respiration. D.O. levels approached stressful levels on the following dates at the indicated depth for the millpond (Site F1) [1]. The results indicate that dissolved oxygen is a problem in the Millpond. See attachments 3,4,&5 for test results.

7-21-94	3.7 ppm	bottom
8-17-94	4.4 ppm	bottom
9-16-94	4.0 ppm	bottom
3-6-95	3.8 ppm	bottom
7-19-95	5.48 ppm	1 meter
8-14-95	0.37 ppm	bottom
9-14-95	4.0 ppm	bottom

[1] At Site F1: D.O., conductivity, salinity, and temperature were measured at the surface, 1 meter and at the bottom. Table Site F1 includes only the 1 meter readings.

B) Dissolved and Total Phosphorus: Dissolved and total phosphorus is the major nutrient contributor to excessive aquatic plant growth including algae blooms. Dissolved phosphorus is the amount of phosphorus immediately available for plant growth. Total phosphorus includes dissolved phosphorus and phosphorus tied up in suspended sediments, plants, and animal fragments. Total phosphorus is considered a better indicator of a lake's nutrient status because its levels remain more stable than dissolved phosphorus. Phosphorus originates from a variety of sources, including animal wastes, soil erosion, detergents, septic systems and runoff from lawns and farmland. To prevent summer algae blooms in impoundments such as the millpond, concentrations should be less than 10 ug/L (micrograms per liter) for dissolved phosphorus and less than 30 ug/L for total phosphorus. Both concentration levels were exceeded several times at the various sites during the 14 month sampling period. See attachment 6 for phosphorus test results.

C) Nitrogen: Nitrogen is second only to phosphorus in contributing to excessive aquatic weed growth and algae blooms. Nitrogen is not a naturally occurring mineral in soil, but rather a component of all organic matter (plants and animals). Decomposing organic matter releases ammonia, which is converted to nitrate in the presence of oxygen. Nitrate (NO_3^-), Nitrite (NO_2^-), and Ammonium (NH_4^+) are the inorganic forms of nitrogen available for aquatic plants and algae. Nitrogen contributing sources include rainfall, lawn and field fertilizers, animal wastes, and seepage from septic systems. If the previous inorganic forms of nitrogen exceed 0.3 mg/L in spring, there is sufficient nitrogen to support summer algae blooms. The majority of the nitrogen results exceed this standard. See attachments 7 & 8 for nitrogen test results.

D) Chloride: Typical levels for surface waters in Door County should range from 3 mg/L to 10 mg/L. Levels higher than 10 mg/L would indicate possible water pollution. Chloride, however, does not affect plant or algae growth, but it could be toxic to aquatic organisms at higher concentrations. The presence of increased chloride levels would also suggest that other nutrients are entering the millpond. Chloride pollution sources would include: septic systems, animal wastes, potash fertilizers and drainage from road salting. The one sampling for chloride occurred on March 31, 1995, and the result of 18.8 mg/L indicates an influx of chloride and possibly other pollutants.

E) pH, Alkalinity and Hardness: Alkalinity and hardness are indicators for a lakes acid buffering capacity. Buffering increases with the presence of calcium or magnesium rich limestone deposits. If the pH were to drop below 5.0, the spawning of the millpond fishery would be inhibited. At no time did the millpond pH drop below 6.6 High levels of hardness (greater than 150 mg/L) and alkalinity can cause marl ($CaCO_3$) to precipitate. Hard water lakes also have a tendency to control algae blooms by precipitating phosphorus with the marl. The alkalinity level measured 252 mg/L and the hardness calculated out to 292 mg/L on March 31, 1995. See attachment 9 for pH test results. The results will be interpreted in the final report.

F) Sodium and Potassium: Levels of sodium and potassium are low in both soil and water, thus their presence may indicate pollution caused by man. Road salt, fertilizers, and human or animal wastes are again the possible sources. Sodium and potassium levels measured 6.8 mg/L and 3.4 mg/L respectfully on March 31, 1995. The levels present on March 31,1995 indicate that an influx of pollutants is occurring.

G) Sulfate: Sulfate concentrations for surface waters in Door County should range from 10 mg/L to 20 mg/L. Sulfate in surface water is primarily related to the types of minerals found in the watershed and to acid rain. In oxygen depleted water, sulfate can be reduced to hydrogen sulfide (H_2S). Hydrogen sulfide gas smells like rotten eggs and is toxic to aquatic organisms. Sulfide ions can also cause lower metal concentrations by forming sulfide precipitates. A sulfate level of 15 mg/L was observed on March 31, 1995.

H) Conductivity: Conductivity measures waters ability to conduct an electrical current. Conductivity is thus related to the amount of substances dissolved in the water. If conductivity values are greater than twice the water hardness, the water is likely receiving high concentrations of contaminants. On March 31, 1995, the conductivity measured 330 umhos/cm versus a calculated hardness of 292 mg/L. See attachment 10 for conductivity test results. The results indicate a moderate level of pollutant loading. See attachments 10 and 11.

I) Water Clarity: Water clarity indicates a lakes overall quality by measuring chemical and physical properties. The secchi disc reading, turbidity and chlorophyll *a* concentrations are the three main components of water clarity. Secchi disc readings are taken with an 8-inch diameter weighted disc painted black and white. The depth which the disc disappears from sight, and then raised until it's just visible would be the secchi reading. The millpond had an average secchi reading of 4 feet, which would be classified eutrophic[2] and poor water clarity (see Table 1).

[2] Eutrophic lakes are high in nutrients, support a large biomass and experience frequent winterkills.

Turbidity is also a measure of water clarity that measures suspended particles, rather than dissolved organic compounds. Turbidity can also be caused by algae blooms, which is also the most common reason for low secchi readings. Chlorophyll *a* measures the amount of algae in the water, thus one can determine whether low secchi readings were caused by runoff particulate and/or by an algae bloom. Both chlorophyll *a* results indicate eutrophic water conditions (See Table F1 H_2O samples).

Table 1.

Water Clarity Index	
Water Clarity	Secchi Depth (ft)
Very Poor	3
Millpond Average	4
Poor	5
Fair	7
Good	10
Very Good	20
Excellent	32

Note: Data represented on all attachments and in the above summaries should only be used for discussion purposes. All water chemistry results will be analyzed and presented in the final report.

2. **Millpond Sediment Sampling and Analysis:**

Sediment samples were collected at site 1 on July 5, 1994 with the assistance of WI-DNR staff. Samples collected were sent to the State Laboratory of Hygiene for analysis of herbicide residues, pesticide residues, and metals. See attachment 2 for results.

Sediment sample results for herbicide and pesticide residues are below detectable level. Screening for metals indicate that arsenic is below detectable levels. However, lead and mercury were detectable in the sediments.

3. **Animal Lot Runoff**

Runoff from animal lots and other livestock feeding, loafing and pasturing areas to surface waters can be a significant source of pollutants. Phosphorus, Nitrogen, Bacteria, and COD's are the major pollutants which can have adverse effects on surface and/or ground water quality. Due to limitations of the computer model used for this analysis, only phosphorus impacts will be evaluated.

A total of 49 animal lot operations were inventoried and evaluated for their impacts on the watershed's surface water resources. The inventory was completed during 1995 by Door County Soil and Water Conservation Department staff. Of the 49 animal lots, 24 are located above the Millpond and remaining 25 are located below the Millpond.

Of the 24 animal lot operations located above the Millpond, it was determined that 13 lots discharge runoff into surface waters. This represents an annual load of approximately 304.8 pounds of phosphorus. The remaining 11 animal lots do not impact the surface water quality directly. These lots discharge runoff into closed depressions and/or rock hole openings, which will directly impact the areas groundwater quality and possibly the Millpond.

Of the 25 animal lot operations located below the Millpond, it was determined that 19 lots discharge runoff into the Ahnapee River waters. This represents an annual load of approximately 506.2 pounds of phosphorus. The remaining 6 animal lot operations do not impact the surface water quality directly. These lots discharge runoff to closed depressions and/or rock hole openings, which will impact the areas groundwater quality and possibly the Ahnapee River.

Animal Lot Inventory Results - Surface Water

Subwatershed		Number of Animal Lots	Total Phosphorus[3] (lbs)
Silver Creek	(SV)	3	53.5
Ahnapee River	(AR)	4	102.2
Maplewood Swamp	(MS)	4	129.5
Forestville Millpond	(MP)	2	19.6
Millpond Totals		13	304.8
Rosiere	(RS)	5	272.3
Kolberg/Forestville	(KF)	14	233.9
Ahnapee River Totals		19	506.9
Watershed Totals		32	811

[3]Based on Annual Phosphorus Loads

4. **Upland Erosion and Sediment Delivery**

Intensive agricultural practices have caused considerable amounts of sediment to reach the watershed's surface water resources. The shift from a conventional dairy based agricultural community to a truck/cash crop based agricultural community in recent years has accelerated soil loss and/or sediment delivery rates throughout this area.

To determine the impacts of this change on the water quality of the Ahnapee River and the Forestville Millpond, a comprehensive landuse inventory was conducted.

As part of the inventory, the watershed was divided into six subwatersheds. Within the boundaries of each subwatershed a separate inventory and analysis was completed. This activity included the delineation of all agricultural fields, documenting the field acreage, predominate soil types, the fields slope length and percent, all cropping histories for the past 10 years, and any apparent conservation practices. This information was entered into a computerized database. After all information was entered, the WIN-HUSLE sediment and phosphorus delivery model was executed. The WIN-HUSLE model estimates the amount of sediment delivered from a particular field to a water body. The model also estimates the amount of sediment deposited in a surface water body and the amount of sediment which remains in suspension. The results of the subwatershed analysis are presented below.

Results from WIN-HUSLE Model per Subwatershed

Subwatershed	Cropland Acres	Sediment Load (T/yr)	Sediment Rate (T/ac/yr)	Phosphorus Load (lbs/yr)
Silver Creek (SV)	2,273.5	987	0.43	11,844
Maplewood Swamp (MS)	2,613.1	567	0.22	6,804
Forestville Millpond (MP)	322.8	323	0.32	3,876
Ahnapee River (AR)	2,403.4	637	0.26	7,644
Millpond Totals	7,612.8	2,514	NA	30,168
Rosiere (RS)	2,273.5	987	0.43	11,844
Kolberg/Forestville (KF)	6,106.4	5,215	0.85	62,568
Ahnapee River Totals	8,849.8	6,034	NA	74,412
Watershed Totals	17,229.7	8,548	NA	104,580

The Win-husle model also allows for a comprehensive analysis of the entire watershed or it can be segmented. The model was run for the entire Millpond subwatershed. This analysis estimates the amount of sediment entering the millpond on an average year.

An evaluation of the 16,754 cropland acres in the millpond subwatershed yielded a total of 2,514 tons of sediment delivered to water bodies annually. It was determined that of the 8,548 tons/year of sediment delivered to the water bodies in the Forestville Millpond subwatershed, approximately 381 tons enter the millpond waters. The represented pounds of phosphorus for 381 tons of sediment equals 4,572.

An evaluation of the cropland sediment delivered to the surface waters below the millpond dam structure was completed and the data was represented the table above. However the win-husle model was not segmented for the area below the millpond due to the lack of information needed to route the surface waters back to the Ahnapee River. Therefore information represented is the sediment load to all surface waters and not for the Ahnapee River per sae'.

Results from the WIN-HUSLE Model for the Portion of the Ahnapee River Watershed located in Door County

	Millpond	Below Millpond	Totals
Total Acreage	16,754	13,367	30,121
Sediment Delivered	3,069 T/yr	6,821 T/yr	9,890 T/yr
Cropland Acres	8,552	8,380	16,932
Cropland Sediment Delivered to Surface Waters	2,514 T/yr	6,034 T/yr	8,548 T/yr
Cropland Sediment Delivered to Millpond	381 T/yr	NA	NA
Cropland Tons/acre/year	0.27	0.74	0.50

The significant difference between the sediment delivery rates of the upper and lower portions of the watershed is likely indicative of the differences in topography, soil types and land use. The upper portion is interpreted as gently sloping and vegetative cover near stream channels provide a greater buffering effect than is observed in the lower portions of the watershed.

5. **Manure Management/Nutrient Management for Surface Water Considerations**

A comprehensive inventory of all animal operations and associated lands was completed in 1995 by Door County SWCD staff. After the inventory was completed, an analysis of each landowner/operator's manure management practices was completed. This included the analysis of all cropland acres owned and/or operated by a landowner/operator which are within 1.5 miles of the livestock housing.

As part of the surface water analysis, the number of acres of cropland which are determined as unsuitable for winter spreading manure for each livestock operation in the watershed were calculated. Unsuitable acres are defined as cropland which has a slope greater than nine percent, are within a ten year flood plain, or within 200 feet of concentrated flow path. Animal manure spread on these acres during the winter months is very susceptible to runoff and will impact surface water quality.

Nutrient Management, as defined by Natural Resource Conservation Service specification 590, allows for a maximum of 75 lbs. of phosphorus per suitable tilled acre of cropland, to be spread during the winter months. The maximum rate that a landowner should be spreading manure equals 25 tons of dry manure per suitable acre or an equivalent tonnage which would equal 75 lbs. of phosphorus.

This analysis was completed on all 46 livestock operations in the watershed. If an operation had an existing animal waste storage facility, the volume of the storage facility was calculated. If adequate storage was present for the number of animals identified at the time of the inventory, then that operation did not have any further analysis completed. Four (4) operations met these requirements. If the computed volume of manure exceeded the existing storage then further analysis was completed. Forty two operations were analyzed for manure management practices.

It was determined that 30 operations had an excess of unsuitable acres after all suitable acres were analyzed. Approximately 745 acres of unsuitable acres are being utilized for winter spreading activities. If these acres were spread with manure at the acceptable rate of 25 ton/acre, approximately 6671 tons of animal waste would be placed on unsuitable acres. The phosphorus values associated with this tonnage equals approximately 177,897 lbs or 89 tons. The model used for this analysis will not determine the amount of manure which enters a body of water.

6. **Streambank Erosion**

A survey of a representative sample of streams was conducted to determine rates of lateral streambank recession in the watershed above the Forestville Millpond. Approximately five miles of streams evaluated.

Observations of recession rates were made from walking the channel or (where conditions warranted) canoeing the stream. Estimates were made of the length and height of the eroding bank. The rate of lateral recession was then estimated utilizing standard indicators. These indicators included amounts of undercutting, exposed roots, fallen trees and the volume of deposited sediment on the opposite stream bank. The causes of the erosion ie. natural recession, trampling of the bank by wildlife or livestock, and adjacent land use was noted. This data was then entered into a computer spreadsheet where the volume of eroded soil was calculated.

The results of the inventory indicate that of the 26,100 feet inventoried, 3,460 feet showed evidence of significant erosion with a total rate of erosion at 8.5 tons/year. Slightly over half of the erosion was attributed to 1,185 feet of streambank trampled by livestock.

The average of 2 tons per year of sediment contributed to surface water per mile of streambank is a relatively low rate of erosion. The low erosion rates are largely attributed to the topography and soil types. The Ahnapee River and its tributaries are low grade low flow streams with meandering channels, wide stream beds and flood plains with persistent wetland vegetation growing through much of the stream channel. These characteristics keep stream velocities low which in turn prevents the slow flowing water from doing the work of cutting away the streambank.

The existing conditions of the streams in the Ahnapee and its tributaries provide low rates of streambank erosion. Opportunities to improve upon the existing conditions, with few exceptions, are limited.

7. **Planned 1996 activities include:**

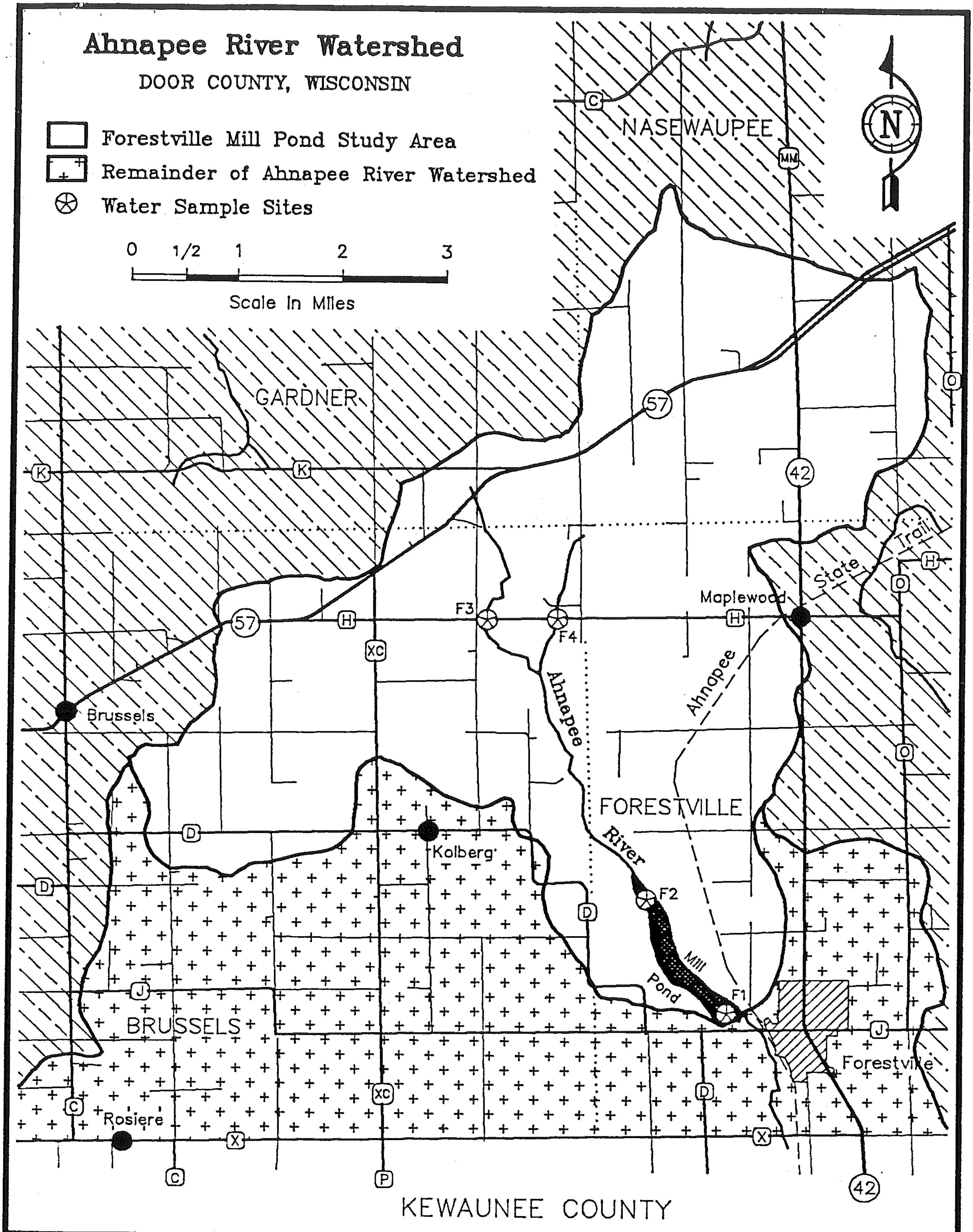
A. Completion of the Adjacent Millpond Landuse and Pollutant Study.

B. Conduct a meeting in the watershed to identify major landowner concerns regarding the Forestville Millpond.

C. Completion of the Final Report for the <u>Wisconsin Lake Management Planning Project Grant for the Forestville Millpond</u> by June 30, 1996.

8. **Disclaimer:**

This report is only an interim project status report and is not the final report for this project. Any interim data represent or inferences made from the data may change in the final report as new data is made available.



Attachment 1

SITE F1 - Sediment

Date Sampled	7/5/94
Test Temperature	23°C

Test: Sediment and Soil for Herbicide Residue

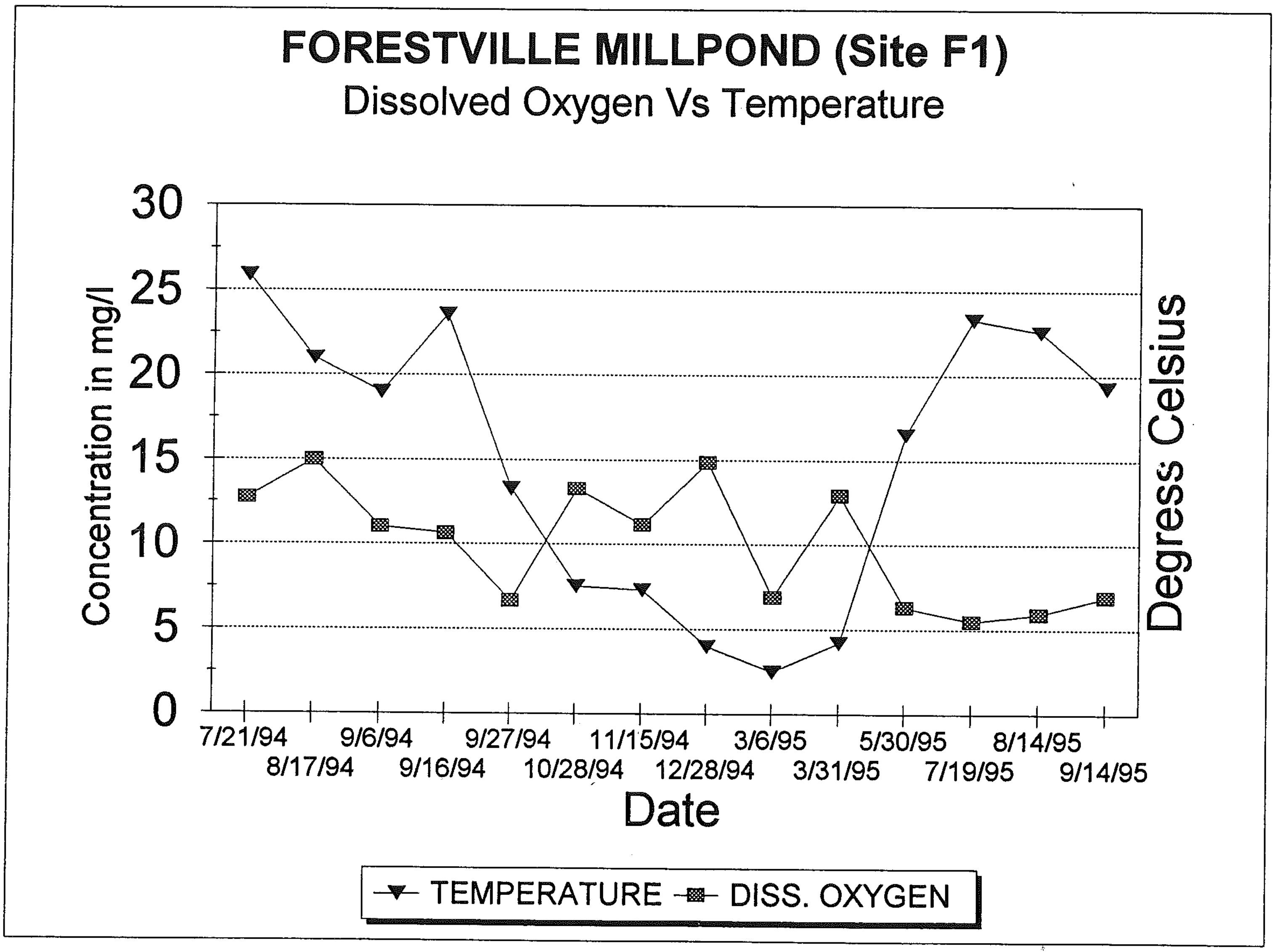
Atrazine	< 0.10 Ug/g Dry
Alachlor (Lasso)	< 0.10 Ug/g Dry
Cyanazine (Bladex)	< 0.10 Ug/g Dry
Metolachor (Dual)	< 0.10 Ug/g Dry

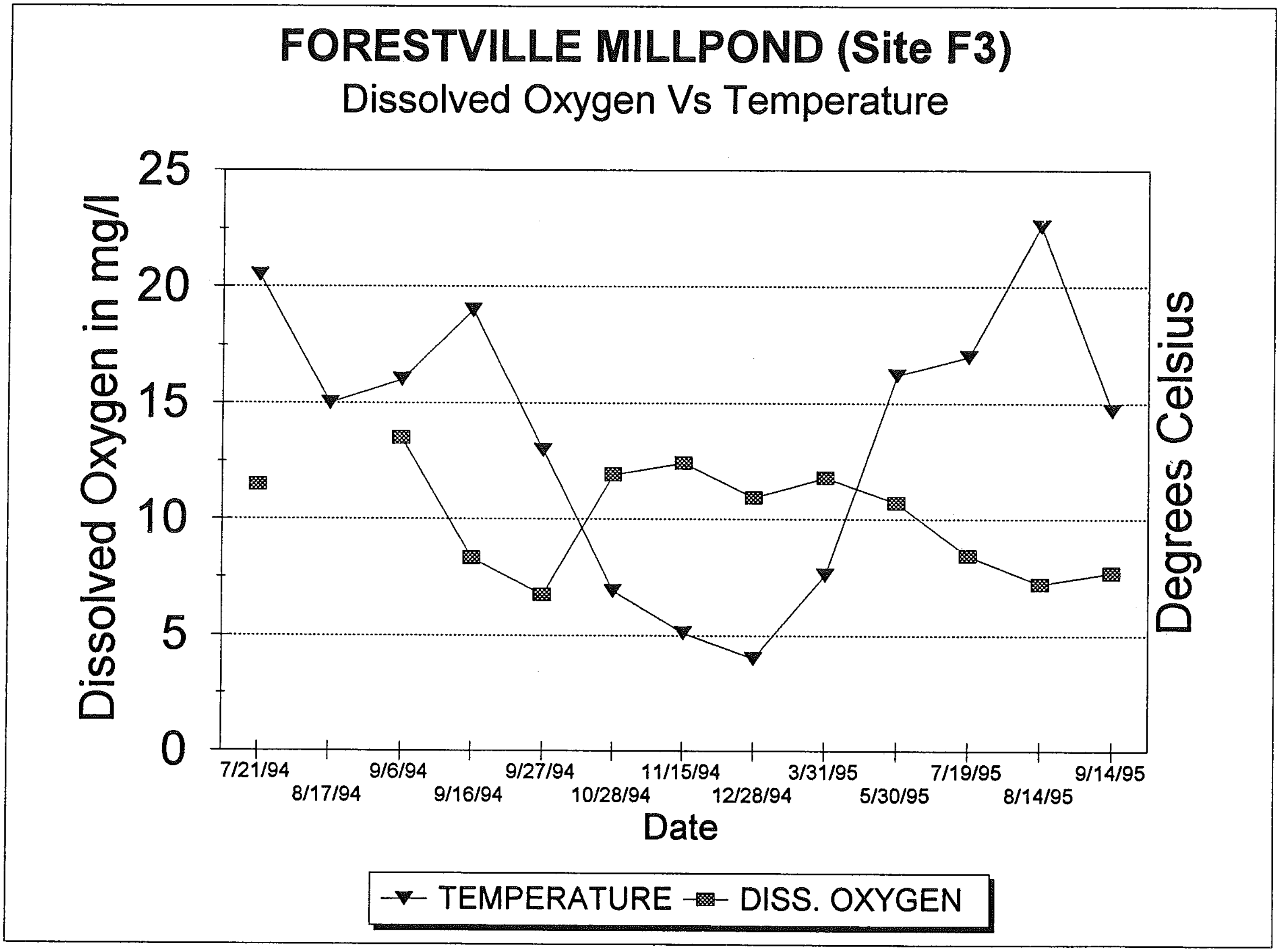
Test: Pesticide Residue in Soil

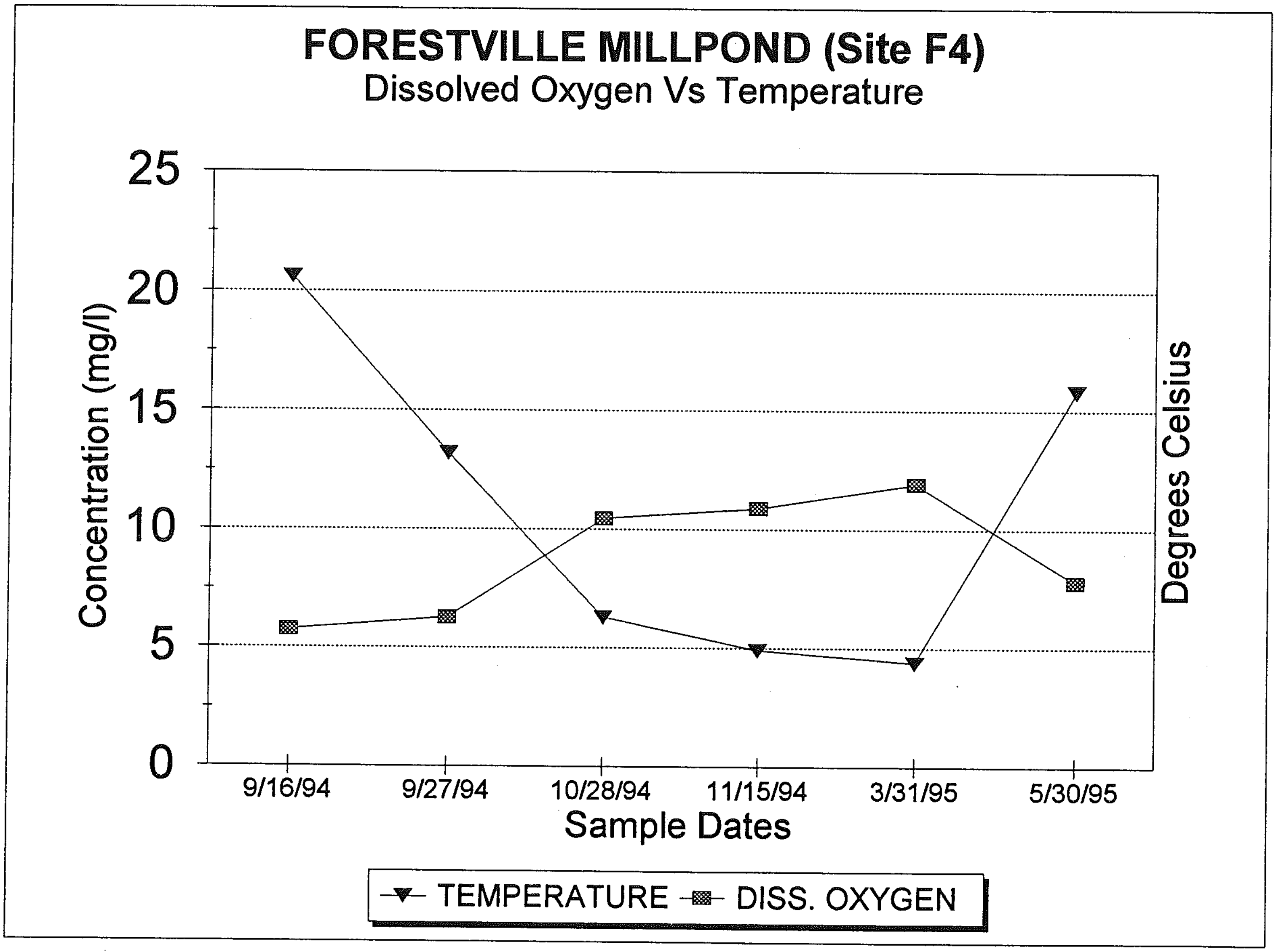
Linuron (Lorox)	< 0.10 Ug/g Dry
Pendimehalin (Prowl)	< 0.10 Ug/g Dry
214-D Chlorophenoxy	< 0.10 Ug/g Dry

Test: Metals

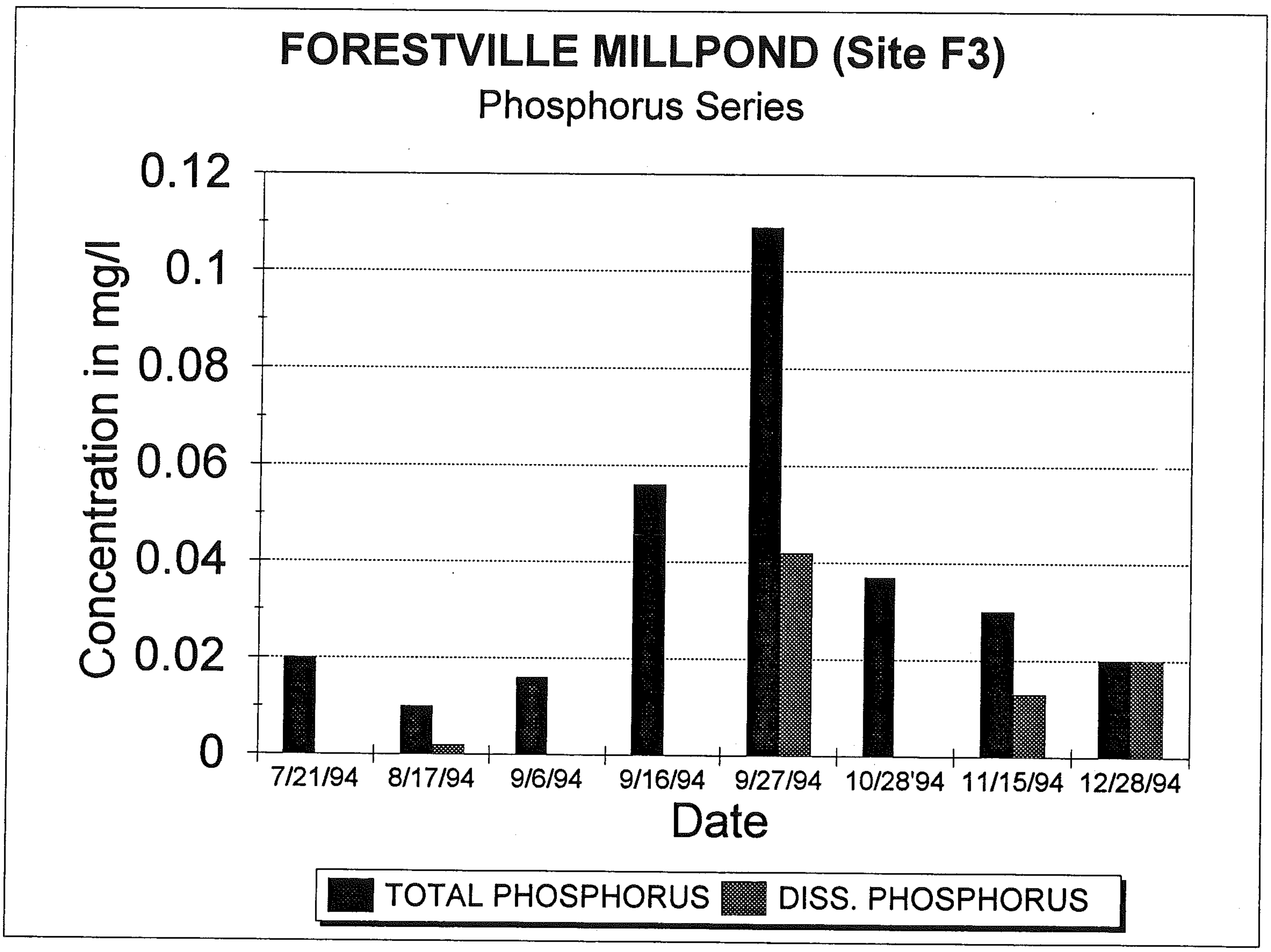
Arsenic Dry WT	< 20. Mg/Kg
Lead Dry WT	18. Mg/Kg
Mercury Dry WT	0.08 Mg/Kg


FORESTVILLE MILLPOND (Site F1)
Dissolved Oxygen Vs Temperature
Concentration in mg/l
30
25
20
15
10
5
0
Degress Celsius
7/21/94
8/17/94
9/6/94
9/16/94
9/27/94
10/28/94
11/15/94
12/28/94
3/6/95
3/31/95
5/30/95
7/19/95
8/14/95
9/14/95
Date
TEMPERATURE
DISS. OXYGEN

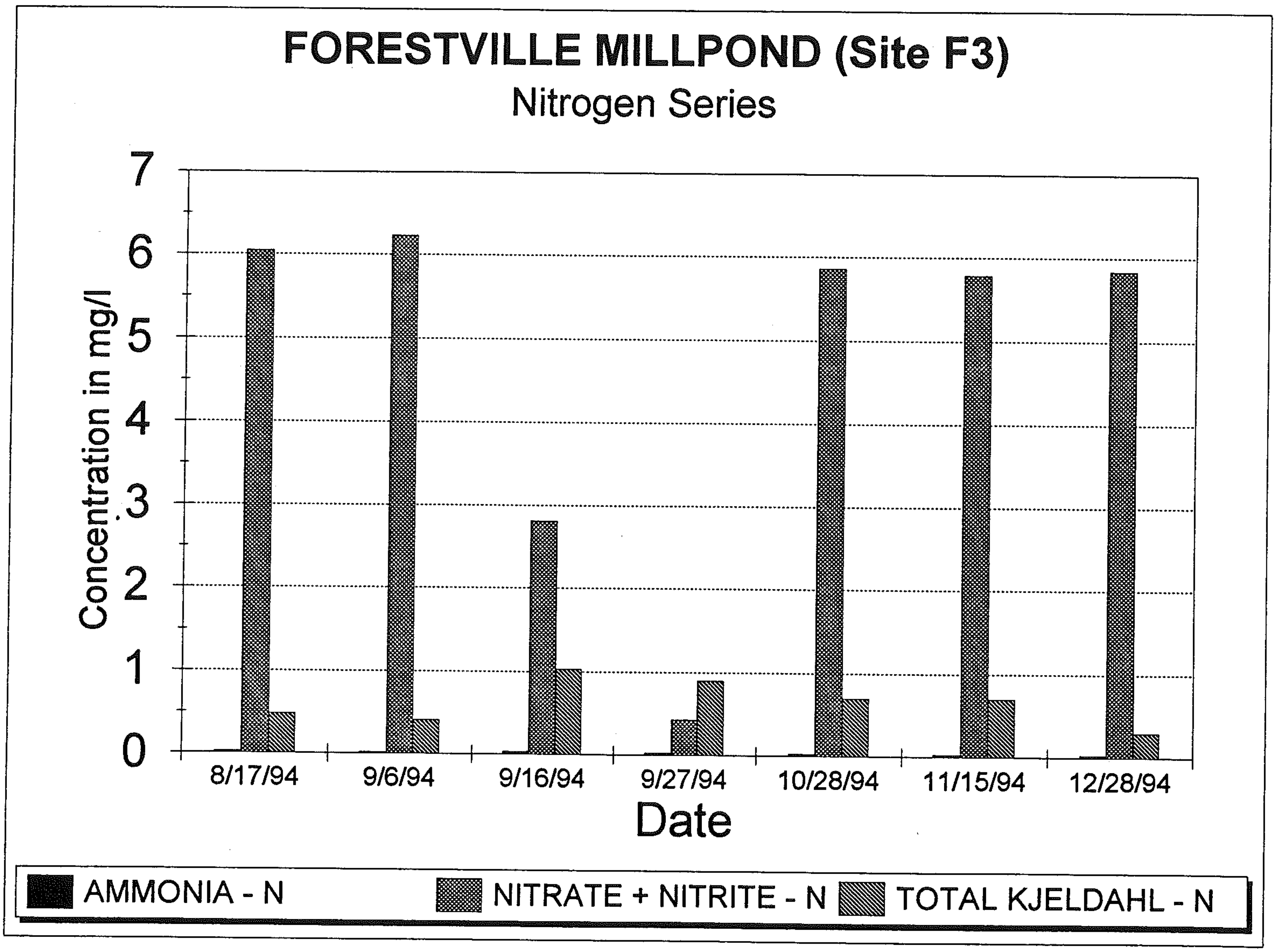

FORESTVILLE MILLPOND (Site F3)
Dissolved Oxygen Vs Temperature
Dissolved Oxygen in mg/l
Degrees Celsius
0
5
10
15
20
25
7/21/94
8/17/94
9/6/94
9/16/94
9/27/94
10/28/94
11/15/94
12/28/94
3/31/95
5/30/95
7/19/95
8/14/95
9/14/95
Date
TEMPERATURE
DISS. OXYGEN

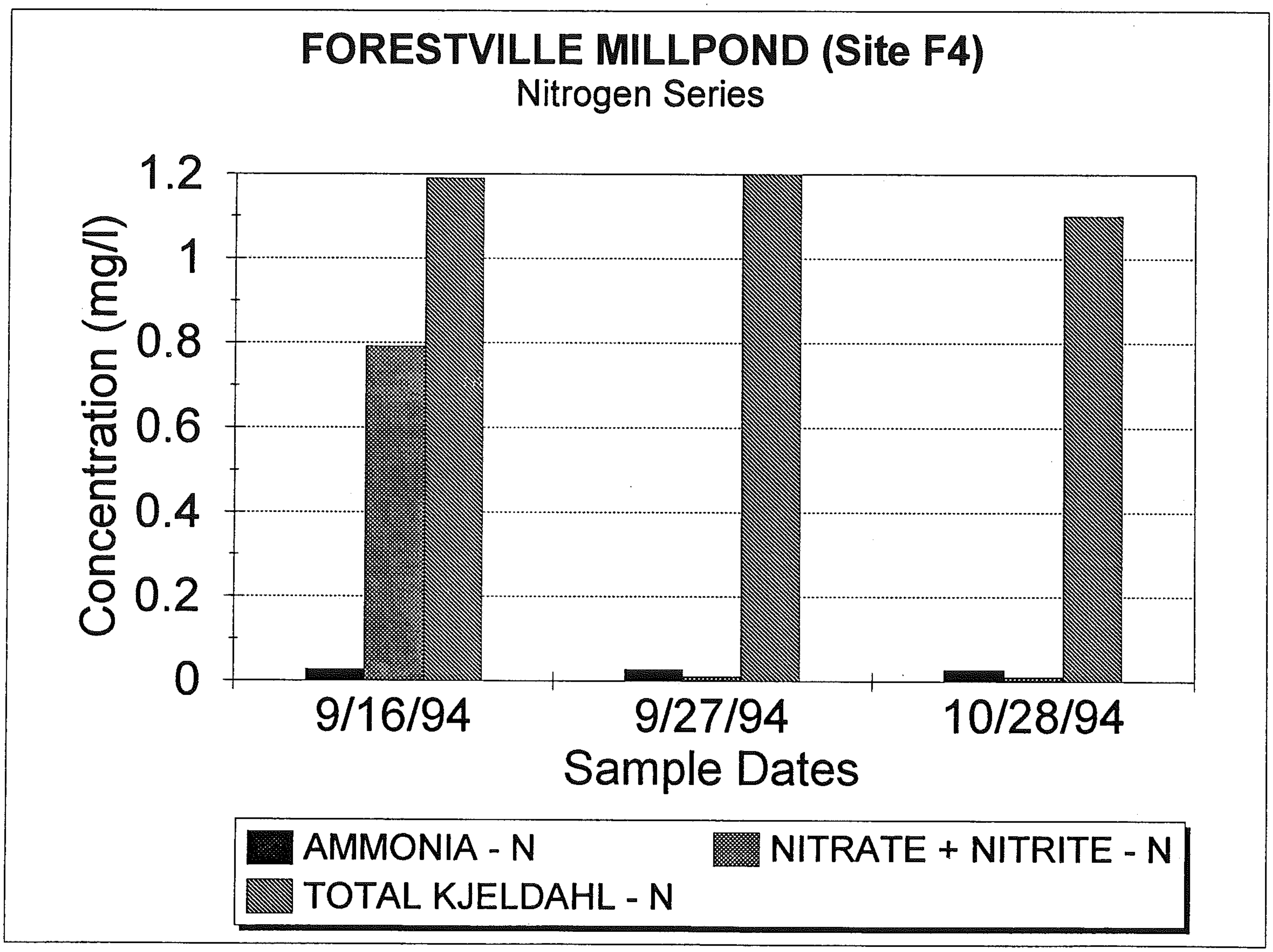


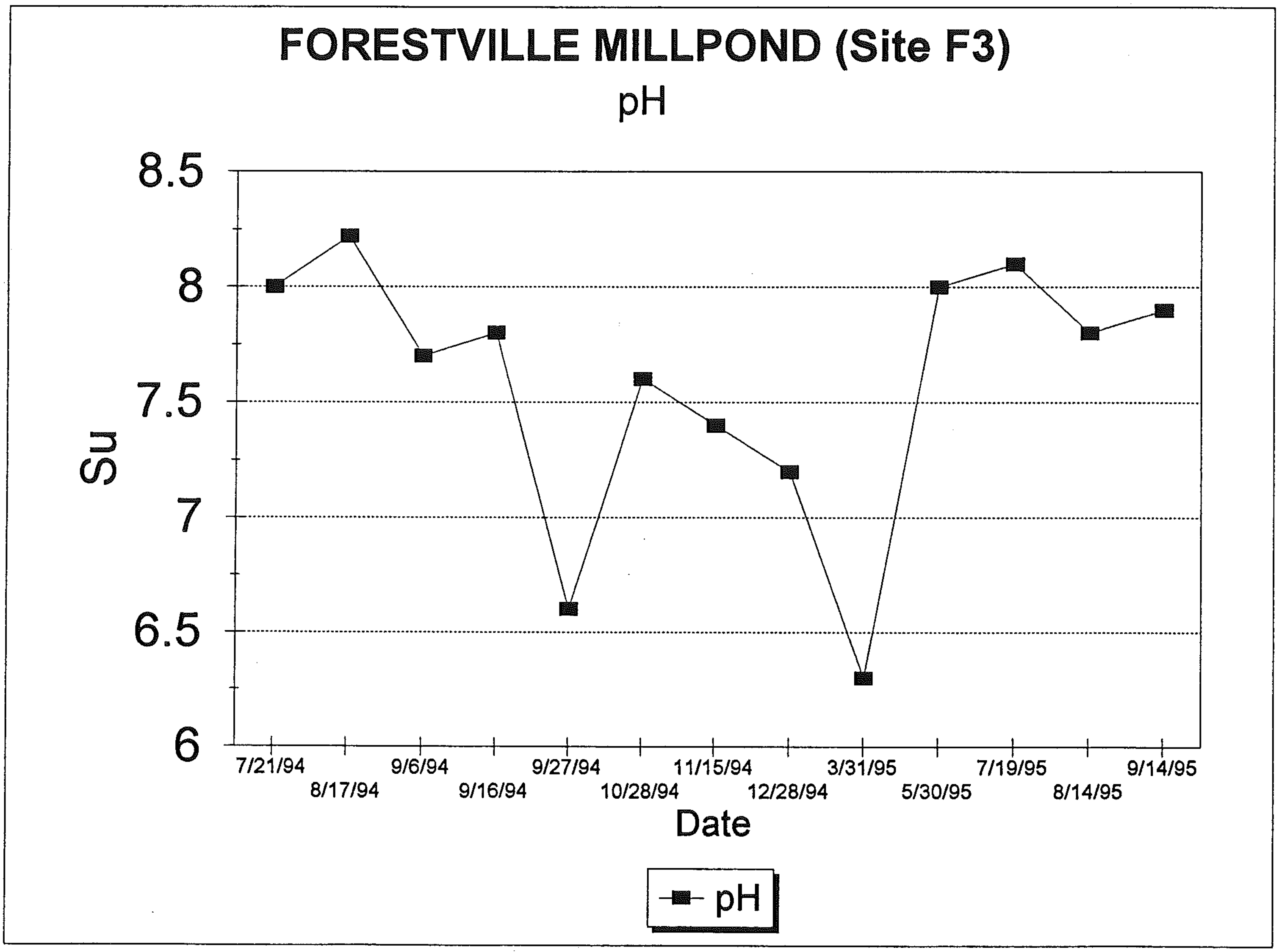
FORESTVILLE MILLPOND (Site F4)
Dissolved Oxygen Vs Temperature
25
20
15
10
5
0
Concentration (mg/l)
Degrees Celsius
9/16/94
9/27/94
10/28/94
11/15/94
3/31/95
5/30/95
Sample Dates
TEMPERATURE
DISS. OXYGEN



FORESTVILLE MILLPOND (Site F3)
Phosphorus Series
0.12
0.1
0.08
0.06
0.04
0.02
0
Concentration in mg/l
7/21/94
8/17/94
9/6/94
9/16/94
9/27/94
10/28'94
11/15/94
12/28/94
Date
TOTAL PHOSPHORUS
DISS. PHOSPHORUS


FORESTVILLE MILLPOND (Site F3)
Nitrogen Series
Concentration in mg/l
7
6
5
4
3
2
1
0
8/17/94
9/6/94
9/16/94
9/27/94
10/28/94
11/15/94
12/28/94
Date
AMMONIA - N
NITRATE + NITRITE - N
TOTAL KJELDAHL - N


FORESTVILLE MILLPOND (Site F4)
Nitrogen Series
Concentration (mg/l)
1.2
1
0.8
0.6
0.4
0.2
0
9/16/94
9/27/94
10/28/94
Sample Dates
AMMONIA - N
NITRATE + NITRITE - N
TOTAL KJELDAHL - N


FORESTVILLE MILLPOND (Site F3)
pH
8.5
8
7.5
7
6.5
6
Su
7/21/94
8/17/94
9/6/94
9/16/94
9/27/94
10/28/94
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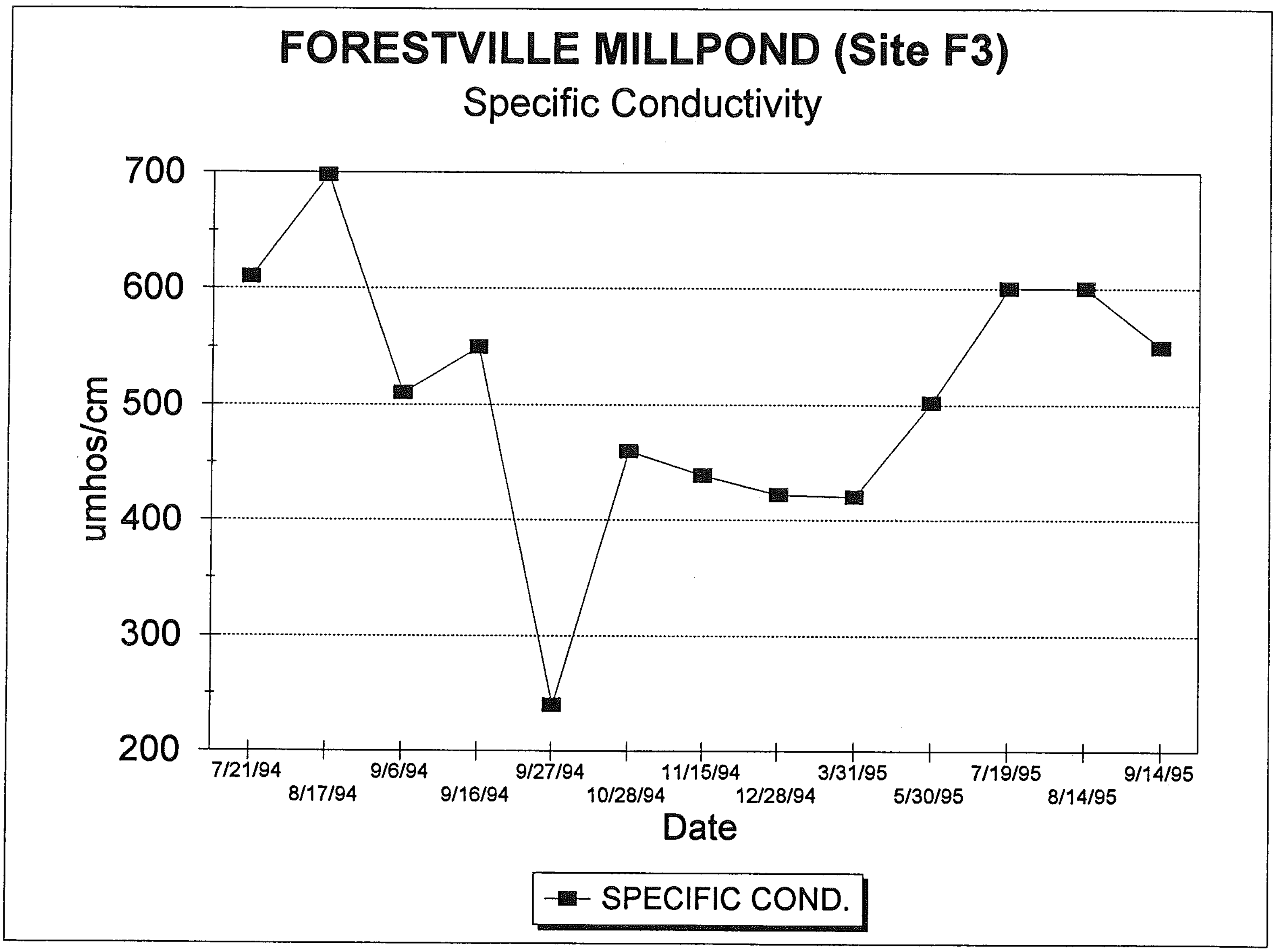
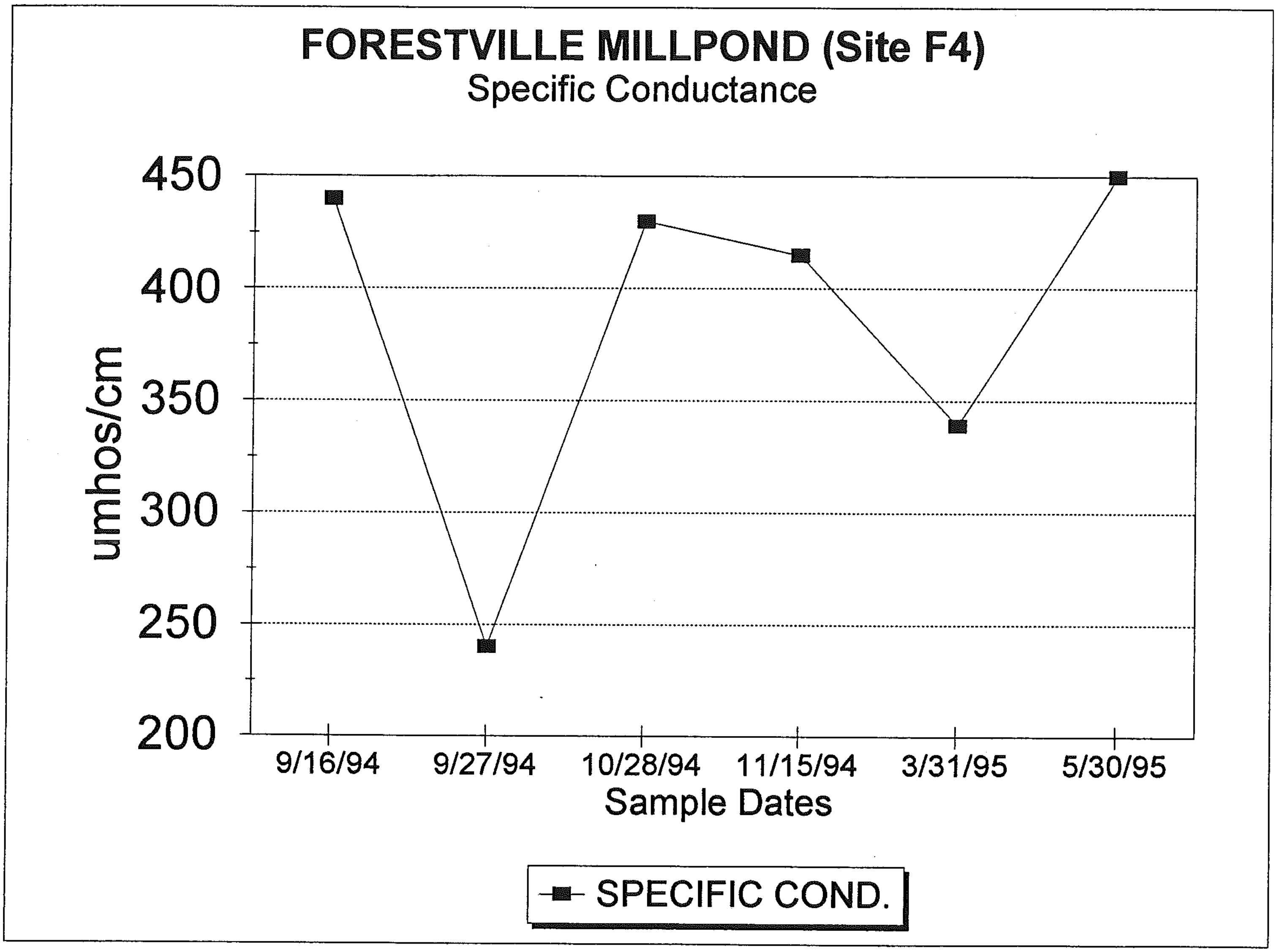
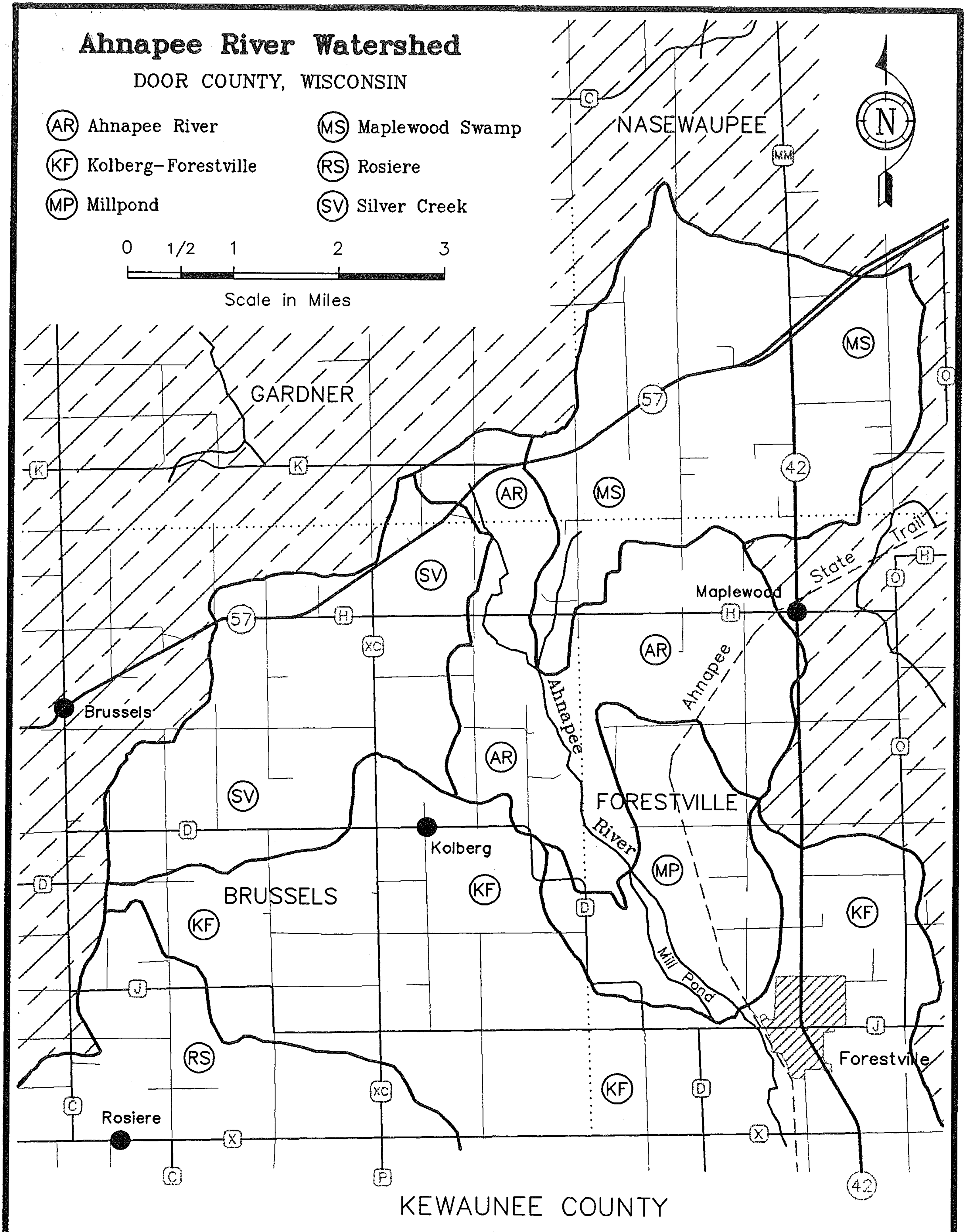
9/14/95
Date
pH



Attachment 10


FORESTVILLE MILLPOND (Site F4)
Specific Conductance
450
400
350
300
250
200
umhos/cm
9/16/94
9/27/94
10/28/94
11/15/94
3/31/95
5/30/95
Sample Dates
SPECIFIC COND.


Ahnapee River Watershed
DOOR COUNTY, WISCONSIN
AR Ahnapee River
KF Kolberg-Forestville
MP Millpond
MS Maplewood Swamp
RS Rosiere
SV Silver Creek
0 1/2 1 2 3
Scale in Miles
N
NASEWAUPEE
GARDNER
FORESTVILLE
BRUSSELS
KEWAUNEE COUNTY
Maplewood
Brussels
Kolberg
Forestville
Rosiere
Ahnapee River
Ahnapee
Mill Pond
State Trail

Approximate Forestville Millpond Expenditures To Date
January 4, 1996

	1994	1995	Total
Personnel	$3,688.96	$9,452.69	$13,141.65
Mileage	$61.11	$245.35	$306.46
Equipment & Supplies:			
Mylar	86.17		
Topo maps	24.52		
Distrilled water	2.64	.79	
Dissolved oxygen meter	878.00		
S.C.T. Meter w/o probe	675.00		
S.C.T. Meter probe	235.00		
pH Tester	53.55		
Calibration kit	16.00		
Shipping	15.30		
Rope	9.99		
Buffer tablets	32.58	33.58	
	$2,028.75	$34.37	$2,063.12
Office Supplies			
Markers	5.20		
Postage	64.94		
	$70.14		$70.14
TOTAL EXPENDITURES	**$5,848.96**	**$9,732.41**	**$15,581.37**

<u>SITE F1</u> H_2O Samples

Date Sampled	7/5/94	7/21/94	8/17/94	9/6/94	9/16/94	9/27/94	10/28/94	11/15/94	12/28/94	3/6/95	3/31/95 [2]	5/30/95	7/19/95	8/14/95	9/14/95
Chlorophyll A uncorrected ug/L	33.5		17.3												
Ammonia-N Mg/L	0.096		0.058	0.064	0.033	0.053	0.049	0.042	<0.027		<0.027				
Nitrate Plus Nitrite-N Mg/L	0.264		0.326	0.446	0.322	0.761	2.32	2.78	4.22		2.06				
Total Kjeldahl Nitrogen Mg/L	1.10		1.25	1.09	1.15	1.02	0.9	0.9	0.7		1.1				
Total phosphorous Mg/L	0.076	0.024	0.040	0.041	0.047	0.123	0.030	0.02	0.008	0.01	0.02				
Dissolved phosphorous Mg/L	0.005		<0.002			0.053		<0.002	<0.002	<0.002					
Suspended solids Mg/L			7.0	5.0	9.0	10.0	4.88	4.88	4.88						
Temp. Field °C @ 1 meter		25.9°	21°	19.0°	23.6°	13.3°	7.5°	7.3°	4.0°	2.5°	4.2°	16.5°	23.3°	22.6°	19.3°
Dissolved umhos/cm Oxygen @ 1 meter		12.74	15.0	11.0	10.62	6.67	13.27	11.14	14.85	6.88 [1]	12.90	6.30	5.48	5.92	6.90
Secchi Depth ft.		4.5	0.9	4.5	3.0	1.5	6.5	7.0	Surface Frozen	Surface Frozen	7.1' bottom	5.0	4.0	2.0	2.0
Conductivity UMHOS/CM		505		470	485	210	430	430	423	410	330	500	470	470	395
pH Field su		8.4		8.4	8.4	6.6	7.8	8.0	7.4	6.8	7.5	7.2	8.4	8.2	8.6
Salinity		<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cloud Cover			5%	20%	0%		100%	0%	100%	100%		0%	90%	50%	100%
Calcium mg/l											64				
Chloride mg/l											18.8				
Alkalinity mg/l											252				
Magnesium mg/l											32				
Potassium mg/l											3.4				
Sodium mg/l											6.8				
Sulfate mg/l											15				
Turbidity NTU											0.7				
Millpond Elevation				592.3'	592.5'	593.2'	592.4'	592.4'	592.5'	592.3'	592.5'	592.6'	592.4'	592.4'	592.3'

1 Additional dissolved oxygen tests within the millpond ranged from 0.5 ppm (bottom) to 10.9 2.0' below surface.

2 Samples taken just after ICE-OUT.

<u>Site F3</u> H_2O Samples

Date Sampled	7/21/94	8/17/94	9/6/94	9/16/94	9/27/94	10/28/94	11/15/94	12/28/94	3/31/95	5/30/95	7/19/95	8/14/95	9/14/95
Ammonia-N Mg/L		0.021	0.011	0.034	0.027	0.027	0.027	0.030					
Nitrate Plus Nitrite-N Mg/L		6.05	6.23	2.81	0.429	5.86	5.79	5.84					
Total Kjeldahl Nitrogen Mg/L		0.48	0.41	1.03	0.90	0.7	0.7	0.3					
Total Mg/L Phosphorous	0.02	0.010	0.016	0.056	0.109	0.037	0.03	0.02					
Dissolved phosphorous Mg/L		0.002			0.042		0.013	0.020					
Suspended solids Mg/L		<2	2	3	12	4.88	4.88	4.88					
Temp °C Field @ 1 foot	20.5°	15°	16°	19°	13°	6.9°	5.1°	4.0	7.6	16.2	17.0	22.6	14.7
Dissolved Oxygen @ 1 ft Mg/L	11.5		13.5	8.3	6.74	11.93	12.42	10.94	11.80	10.70	8.41	7.20	7.67
Conductivity UMHOS/CM	610	(@ 25°C) 698	510	550	240	460	439	422	420	502	600	600	550
pH Field Su	8.0	8.22	7.7	7.8	6.6	7.6	7.4	7.2	6.3	8.0	8.1	7.8	7.9
Salinity	<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity		317											

Site F2 H_2O Samples

Date Sampled	7/21/94
Total phosphorous Mg/L	0.0360
Dissolved Oxygen Mg/L	8.27
pH Field SU	8.0
Specific Conductance umhos/cm	650
Salinity	<1
Temp °C Field	22.3°

NOTE: Sample location was deleted from the study due to repeated representation of the Millpond's water quality.

Site F4 H_2O Samples

Date Sampled	9/16/94	9/27/94	10/28/94	11/15/94	12/28/94	3/31/95	5/30/95	7/19/95	8/14/95	9/14/95
Ammonia N Mg/L		0.027	0.027	0.027	No			No	No	No
Nitrate Plus Nitrite-N Mg/L		0.791	0.01	0.01	Sample			Flow	Flow	Flow
Total Kjeldahl Nitrogen Mg/L		1.19	1.2	1.1	Frozen			Observed	Observed	Observed
Total Phosphorus Mg/L		0.184	0.035	0.02	Channel					
Dissolved Mg/L Phosphorous		0.112		0.004						
Suspended solids Mg/L			4.88	4.88						
Temp °C Field @ 1 foot	20.6°	13.2°	6.3°	4.9°		4.4	15.8			
Dissolved Oxygen @ 1 ft Mg/L	5.75	6.27	10.45	10.88		11.90	7.80			
Specific Conductance umhos/cm	440	240	430	415		339	450			
pH Field	7.4	6.6	6.8	7.4		6.5	7.7			
Salinity	<1	<1	<1	<1		<1	<1			