

# **STRESS STREAM ANALYSIS OF TWO SUB-WATERSHEDS OF CONESUS LAKE**

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Prepared for the

Livingston County Planning Department  
Mount Morris, NY

March 1992

## SUMMARY

1. Stress stream analysis was performed on watersheds of two streams entering Conesus Lake that had been previously recognized as contributing high levels of nutrient to the Lake.

2. Nonpoint pollution sources of the nutrient nitrate were identified in the watersheds of Long Point Gully and "No Name" Creek.

3. Nitrate sources in both streams were attributed to agricultural practices within the watersheds.

4. Best Management Practices implemented in the problem areas of the watersheds would significantly reduce nutrient loadings to Conesus Lake.

## INTRODUCTION

Since 1985, a collaborative research effort, between the State University of New York at Brockport and the Livingston County Planning Department, designed to gather and synthesize information on the "environmental health", aesthetic character, and water quality of Conesus Lake has existed. During this period the water quality of Conesus Lake has been characterized and its trophic status identified. A major shift in the zooplankton structure of the Lake was recognized, and the macrophytes were identified and mapped. Also, biomanipulation experiments were conducted on the macrophytes and evaluated as a lake management strategy. In a major effort, the Conesus Lake watershed was sampled for a complete annual cycle quantifying the sub-watershed water and nutrient load to Conesus Lake. High nutrient loadings to Conesus Lake are believed to fertilize and promote the luxuriant growth of the macrophyte assemblage currently in the Lake. This accelerated macrophyte growth is viewed as a nuisance and a degradation to the quality of the resource.

Nutrient loading analysis of the Conesus Lake tributaries during 1990 - 1991 identified several watersheds that supplied extremely high loadings of nutrients to Conesus Lake (Makarewicz *et al.* 1991). In general, South McMillan Creek was identified as having the highest nutrient loadings to Conesus Lake. This one creek contributes 25%, 23% and 39% of the total phosphorus, total nitrogen and total suspended solids to the Lake, respectively. North McMillan Creek and Hanna's Creek were also identified as being major contributors of phosphorus and nitrogen to the Lake. Two small subwatersheds, Long Point Gully and "No Name" Creek, contributed a surprisingly high [28% and 22% (38.32 and 29.52 g N/ha/d)] annual nitrate load (on

an areal basis) to Conesus Lake (Table 1). This suggested a potential source or sources of nitrate within these sub-watersheds.

While point and nonpoint sources of nutrients need to be diagnosed in all of these problem watersheds, Long Point Gully and "No Name" Creek were targeted for stress stream analysis to locate the potential sources of nitrate (as well as other nutrients) within their watersheds because of their small watershed size and funding limitations. Stress stream analysis is a technique that divides the watershed into small distinct units. Samples are taken at the beginning and the end of each unit of the stream to determine if a nutrient source occurs within the sub-watershed. Once identified, sources may be corrected using "Best Management Practices" (BMP).

## METHODS

Stress stream analysis was performed on seven dates from 4 December 1990 to 10 March 1992. Samples were taken at numerous locations on the stream(s) to identify potential areas of high nutrient input. Long Point Gully was sampled at two sites on 4, 11 and 18 December 1990, at two sites and a well on 2 January 1991. Long Point Gully and No Name Creek were comprehensively sampled on 8 January 1991, 18 February 1992 and 10 March 1992. Samples were taken at all roads where the tributary crossed the road to pinpoint and confirm the source areas. Six sites were visited on Long Point Gully, while eight sites were sampled on No Name Creek (Figures 1 and 2).

All samples were analysed for nitrate, total phosphorus and total kjeldahl nitrogen. Soluble reactive phosphorus was measured on samples taken on 8 January 1991 and earlier, while total suspended solids were measured on samples taken in 1992. Areas of high nutrient loading were further evaluated as to land use and the current condition of the area (ie. plowed, manure spread etc.).

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1. In the sodium salicylate-sodium nitroprusside solution, sodium nitroprusside was increased to 0.4 gm/L
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3. Other reagents were made fresh prior to analysis.

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## RESULTS

### LONG POINT GULLY

#### *Initial Sampling*

Long Point Gully is the major contributor of nitrate to Conesus Lake on an areal basis (Table 1). Early sampling efforts suggested that a single upstream branch of the creek seemed to be supplying the major portion of nitrate to the watershed especially during precipitation events or snow melt (Table 2).

#### *Well Sampling*

A well at a residence on Stapely Road in the watershed was also sampled for nitrate. It was felt that a well that contained high levels of nitrate would suggest that the source of high nitrate in the area could be naturally occurring. The well sampled did show slightly elevated levels of nitrate (mean = 7.78 mg N/L) but the levels are below the human health hazard of 10 mg/L and well below the surface water levels. This suggests that the high concentrations of nitrate in the streams is not naturally occurring (i.e. mineral formations). Thus, comprehensive watershed sampling efforts were undertaken on 8 January 1991, 18 February 1992 and 10 March 1992 to determine the source(s) of nitrate in Long Point Gully.

#### *Comprehensive Sampling*

Results of the comprehensive sampling are presented in Tables 3 - 5. The major nitrate source to Long Point Gully can be attributed to the area between Sites LPG5 and LPG6. On sampling dates 1/8/91 and on 2/18/92 the highest nitrate concentrations in the watershed were found at Site LPG5 (highlighted in Table 3). This indicates that there is a source of nitrate upstream from LPG5. The comprehensive sampling done on 3/10/92 indicates the area of highest nitrate input to the stream. The difference in nitrate concentrations between sites LPG5 and LPG6 definitively shows that the source occurs in the area between them. The nitrate value for LPG6 was 1.19 mg N/L while a short distance downstream at LPG5 the nitrate value was 21.51 mg N/L. Figure 3 illustrates the nitrate concentrations geographically on the 2/18/92 sampling date by showing the nitrate concentrations on a map of the sub-watershed. On 2/18/92 there was no flow at Site LPG6. Elevated levels of total phosphorus and TKN were also identified at Sites LPG4 and LPG5 (Table 4) which further supports the contention

that the area between LPG4 and LPG5 are the cause of increased nutrient concentrations in this watershed.

*What is the cause of elevated nitrate levels?* Agricultural sources of nitrate and total phosphorus could include manure and synthetic fertilizers. This small area between sites LPG5 and LPG6 is a corn field that is drained by a ditch running through it. Farming practices used in this field are the most likely causes of the high nitrate loadings to Long Point Gully and ultimately Conesus Lake. Although there was no visible evidence of manure spreading on the dates sampled, TKN is a measure of organic nitrogen which could be caused by manure spreading or portions of crops that are left in the field to degrade. The fact that total suspended solids are low at both Sites LPG5 and LPG6 indicates that the elevated nutrient concentrations in the stream are not caused by soil loss. During high flow periods, the runoff is mobilizing dissolved nutrients from the agricultural fields and transporting them to Conesus Lake.

This field should be targeted for Best Management Practices by the Livingston County Soil and Water Conservation District to reduce the levels of nitrates coming off this relatively small portion of the watershed. A simple change in farming practices may lead to a significant decrease in the nutrient load to Conesus Lake.

## NO NAME CREEK

No Name Creek had the second highest nitrate loading to Conesus Lake on an areal basis (Table 1). Comprehensive sampling was undertaken on two dates in 1992 in an attempt to determine the origin of the nitrate in the watershed. Results of comprehensive watershed analysis on No Name Creek are in Table 4 for 18 February 1992 and in Table 5 for 10 March 1992. Sites of sample collection are identified in Figure 2.

The major source of nitrate is located on the eastern-most branch between Maple Beach Road and Lee Road, between Sites NN7 and NN5 (Figure 2.) This branch of the creek is bounded entirely by land used in agriculture, including fields of corn, wheat and hay and a dairy farm located on the corner of Lakeville - Groveland Road and Lee Road.

Figure 4 shows a map of the No Name watershed with the nitrate concentrations for the 18 February sampling date on it. The highest nitrate concentration occurs at Site NN5 (6.78 mg N/L). Upstream from NN5, Site NN7 the nitrate value on 2/18/92

was 2.14 mg N/L, which suggests a nitrate source between Sites NN5 and NN7 is providing the nutrient to the stream and eventually to Conesus Lake.

A map showing nitrate concentrations for the sampling date 10 March 1992 is presented in Figure 5. Similar to the sampling date in February, the nitrate concentration increases dramatically between sites NN5 and NN7.

Other nutrients (total phosphorus and TKN) are also elevated in this stretch of the Creek. The highest TKN value recorded in this sampling was 3510  $\mu\text{g N/L}$  at site NN5 on 2/18/92, which more than doubled the next upstream site (NN7 - 1680  $\mu\text{g N/L}$ ) (Table 4). This coincided with the highest total phosphorus value at the same time (1636  $\mu\text{g P/L}$ ). Unlike the nitrate source, this particular source of organic nitrogen and phosphorus was not consistently observed and could be linked to a particular agricultural practice that occurs intermittently, manure spreading for example.

*What are the potential sources of nutrients to No Name Creek?* Phosphorus and organic nitrogen could be coming off the livestock lots due to poor waste management and retention, poor practices in manure spreading, or inorganic fertilization of cropland. The low levels of suspended solids indicate that the high nutrient levels are not due to soil erosion, further reinforcing the contention that the sources are soluble in water or are applied to the soil surface where they are washed off into the stream. As indicated by total suspended solids, there does appear to be some soil erosion in the field between NN4 and NN6 (Table 4 and Figure 4).

Table 2. Initial sampling on Long Point Gully. The map of the sites can be found on Figure 1. TKN = total kjeldahl nitrogen, TP = total phosphorus and SRP = soluble reactive phosphorus.

DATE	SITE	NITRATE (mg N/L)	TKN ( $\mu\text{g}$ N/L)	TP ( $\mu\text{g}$ P/L)	SRP ( $\mu\text{g}$ P/L)
12/4/90	LPG1	0.83	720	128.3	68.1
	LPG4	7.46	1,900	313.2	240.2
12/11/90	LPG1	5.41	400	43.1	39.1
	LPG5	17.71	70	97.1	91.8
12/18/90	LPG1	4.38	380	48.6	41.2
	LPG5	12.70	830	160.3	156.6
01/02/91	LPG1	5.24	370	64.5	53.5
	LPG5	16.52	1,640	443.3	413.9
	Well	7.60	240	20.7	20.7
01/08/91	LPG1	4.74	320	49.7	45.7
	LPG2	4.70	420	34.1	9.4
	LPG3	10.42	410	68.5	11.1
	LPG4	16.96	10	70.0	47.2
	LPG5	20.3	10	95.3	87.6
	Well	7.96	90	21.7	20.8

Table 3. Stress stream analysis for nitrate on Long Point Gully for three dates. Nitrate values are in mg N/L. A map of the sites can be found in Figure 1. In general, the site number increases further upstream. NS = not sampled.

SITE	DATES		
	1/8/91	2/18/92	3/10/92
LPG1	4.74	7.12	12.32
LPG2	4.70	6.88	9.73
LPG3	10.42	6.95	19.08
LPG4	16.96	10.38	24.45
LPG5	20.30	14.15	21.51
LPG6	NS	No flow	1.19

Table 4. Analytical results of stress stream analysis on 18 February 1992 on Long Point Gully and No Name Creek. TKN = total kjeldahl nitrogen, TP = total phosphorus, TSS = total suspended solids.

SITE	NITRATE (mg N/L)	TKN ( $\mu$ g N/L)	TP ( $\mu$ g P/L)	TSS (mg/L)
No Name				
NN1	3.86	790	50.7	1.9
NN2	6.01	980	57.9	3.0
NN3	2.15	740	16.4	2.0
NN4	1.92	570	30.0	10.0
NN5	6.78	3,510	1,636.4	9.1
NN6	1.04	770	60.8	27.3
NN7	2.14	1,680	373.1	4.7
NN8	1.10	790	20.7	2.9
Long Point				
LPG1	7.12	520	40.3	0.1
LPG2	6.88	570	40.7	2.5
LPG3	6.95	1,190	204.6	73.7
LPG4	10.38	2,540	441.8	169.9
LPG5	14.15	780	53.6	10.4

Table 5 . Analytical results of stress stream analysis on 10 March 1992 on Long Point Gully and No Name Creek. TKN = total kjeldahl nitrogen, TP = total phosphorus, TSS = total suspended solids.

SITE	NITRATE (mg N/L)	TKN (µg N/L)	TP (µg P/L)	TSS (mg/L)
No Name				
NN1	6.13	610	34.0	1.2
NN2	11.62	1,020	102.8	2.6
NN3	4.15	350	9.0	1.2
NN4	3.93	450	9.9	< 1.0
NN5	12.71	960	116.5	< 1.0
NN6	2.85	570	16.0	1.9
NN7	6.07	1,210	220.2	1.1
NN8	3.04	460	16.8	1.7
Long Point				
LPG1	12.32	590	34.5	4.1
LPG2	9.73	620	15.6	1.9
LPG3	19.08	420	41.5	4.9
LPG4	24.45	850	91.7	1.1
LPG5	21.51	1,150	122.1	1.4
LPG6	1.19	630	99.2	15.6

## RECOMMENDATIONS:

1. The Livingston County Soil and Water Conservation District should approach the farmers in the areas identified as nonpoint sources of nutrients to review the agriculture practices employed by them. Potential problem areas could include over-fertilization of cropland, poor timing of fertilization, poor choice of tillage practices, improper animal waste management, etc. Corrective action is often quite simple and may have dramatic effects in final nutrient loads to Conesus Lake

2. A best management practice could be designed for the affected area. Best management practices (BMP) have been used for reducing nonpoint source pollution and can be designed to reduce sediment and nutrient transport to streams and lakes. BMP's include agronomic practices such as conservation or reduced tillage, crop rotation, vegetative cover, crop residue, and nutrient management (Johengen *et al.* 1989, Haith 1975, NYSDEC 1986). They may also include structural devices such as grassed waterways, sediment retention basins, erosion control weirs and animal waste holding tanks. BMP's may also benefit the farmer in the long term by decreasing fuel and fertilizer costs and by improving soil productivity.

3. Other polluted sub-watersheds should be investigated and remediated. South McMillan, North McMillan and Hanna's Creeks are the sub-watersheds that have the highest nutrient impact on Conesus Lake. These three streams contribute approximately 60% of the total phosphorus and organic nitrogen (57.5% TP; 60.2% TKN) to Conesus Lake.

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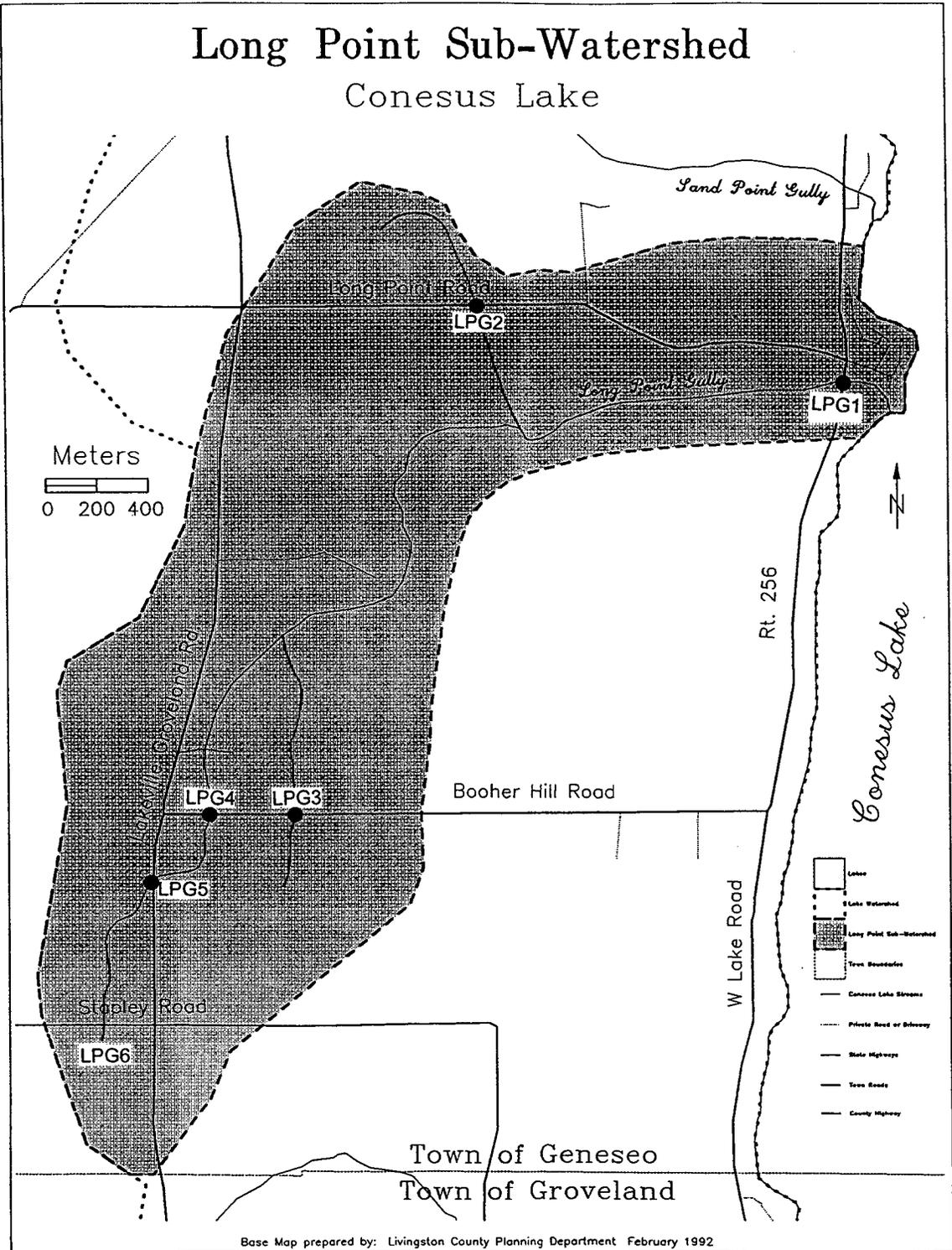


Figure 1. Long Point Gully sub-watershed with comprehensive sampling sites.

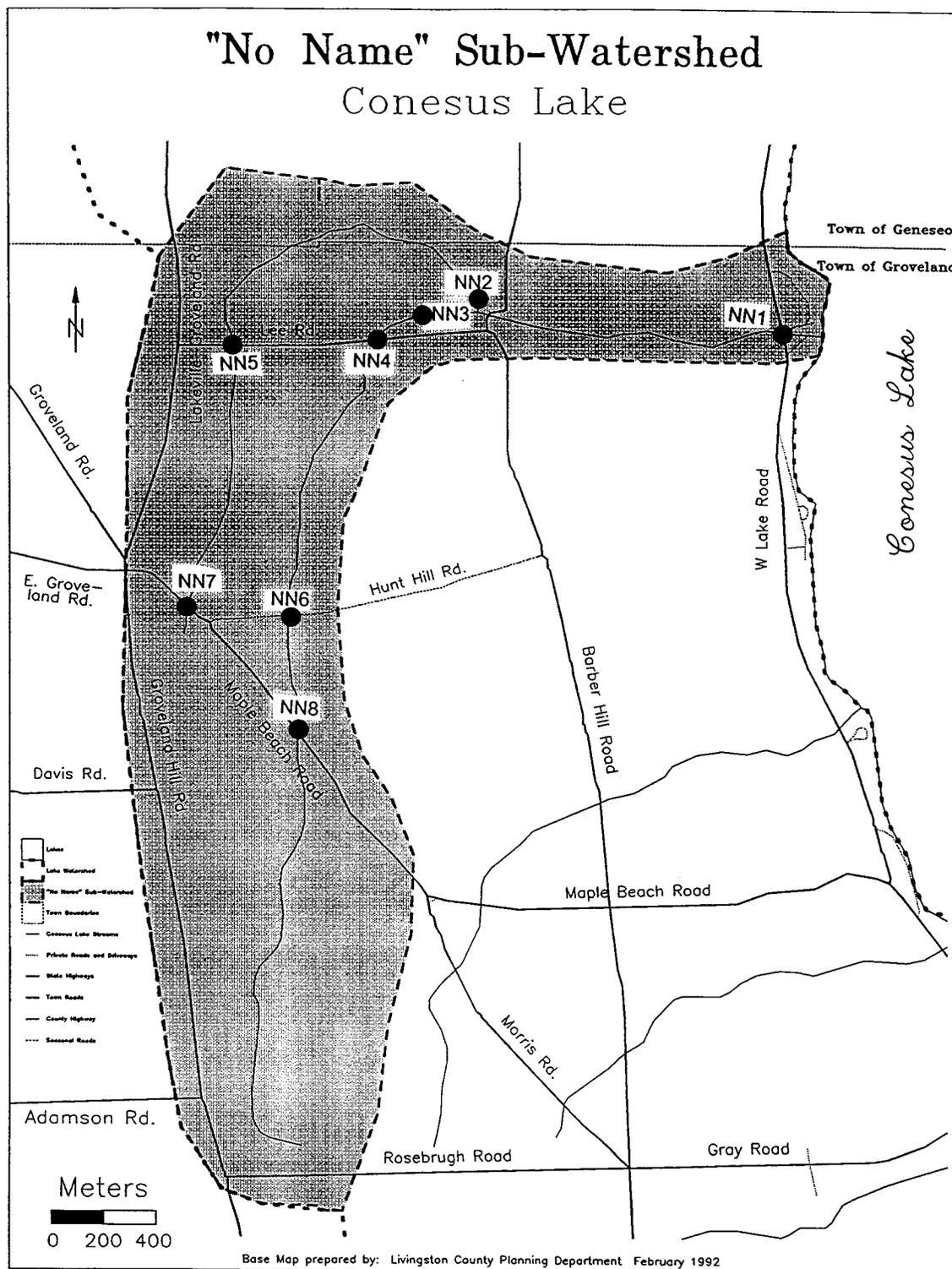


Figure 2. No Name Creek sub-watershed with comprehensive sampling sites.

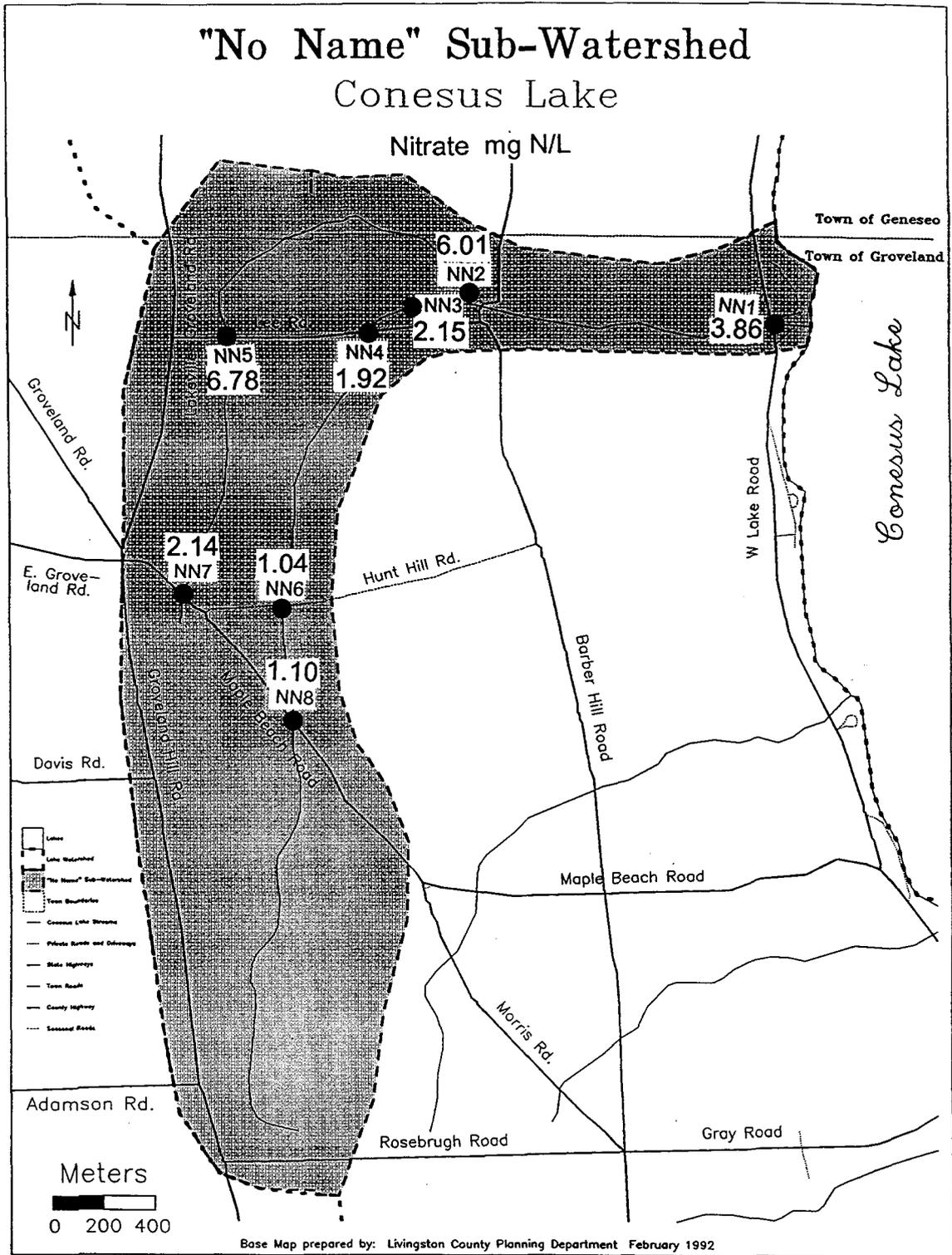
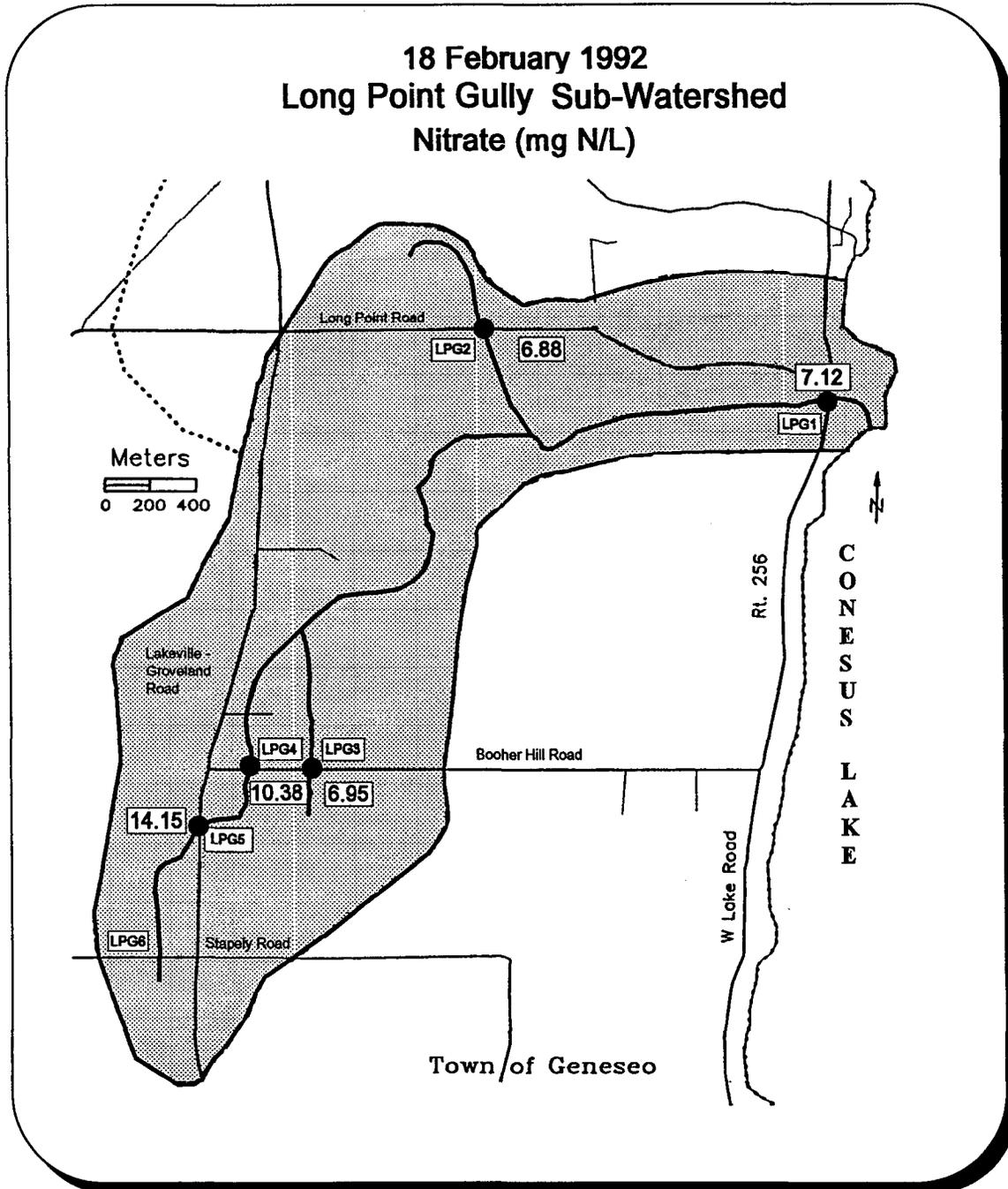


Figure 4. Results of stress stream analysis for nitrate on 18 February 1992. Sampling occurred during a precipitation event coinciding with the breakup of ice in the stream.

Figure 3. Results of stress stream analysis for nitrate on 18 February 1992. Sampling occurred after a precipitation event coincident to the breakup of ice in the stream. Site LPG6 was still frozen and no flow was occurring.



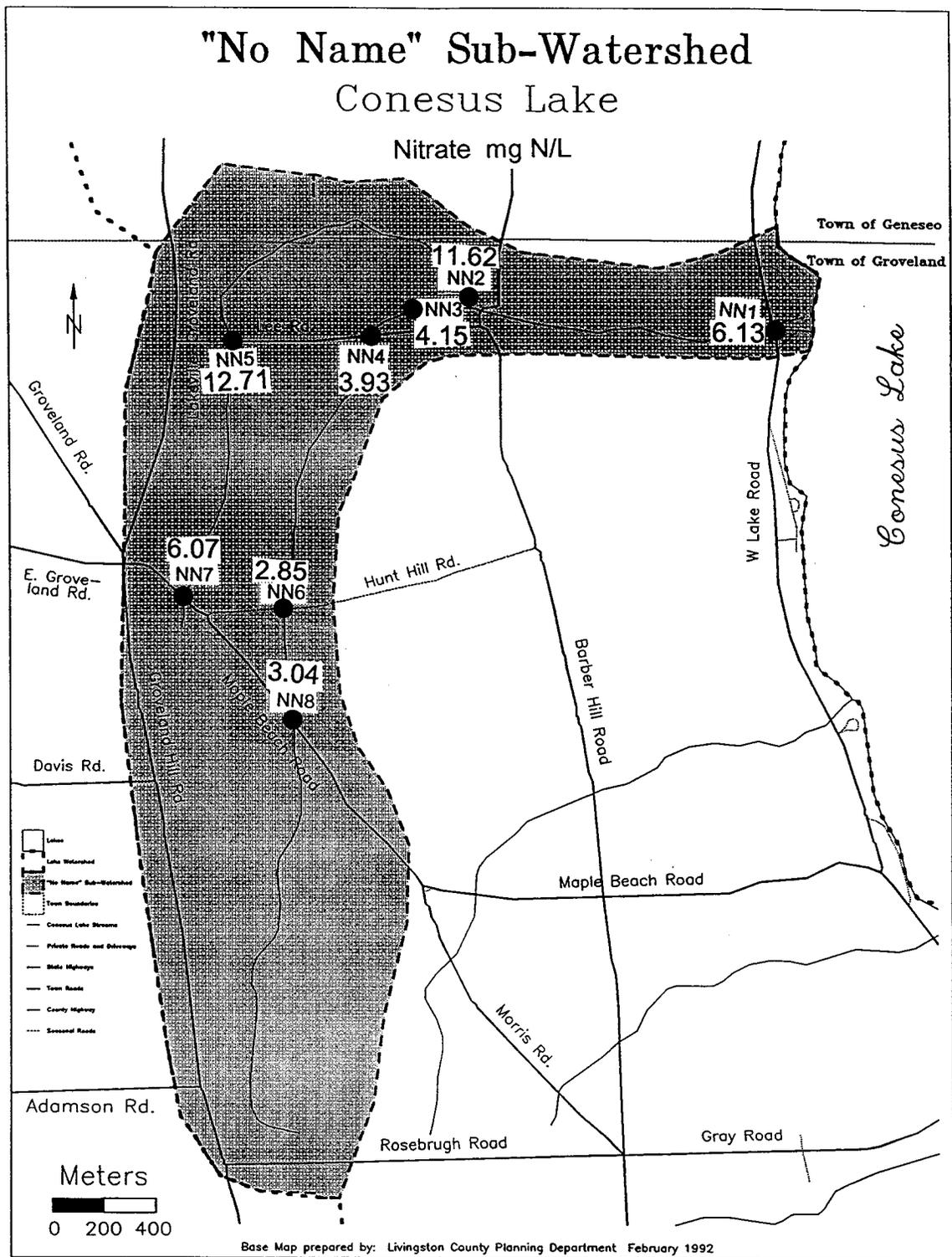


Figure 5. Results of stress stream analysis for nitrate on 10 March 1992. Sampling occurred during a precipitation event.

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Long Point Gully is the major contributor of nitrate to Conesus Lake on an areal basis (Table 1). Early sampling efforts suggested that a single upstream branch of the creek seemed to be supplying the major portion of nitrate to the watershed especially during precipitation events or snow melt (Table 2).

#### *Well Sampling*

A well at a residence on Stapely Road in the watershed was also sampled for nitrate. It was felt that a well that contained high levels of nitrate would suggest that the source of high nitrate in the area could be naturally occurring. The well sampled did show slightly elevated levels of nitrate (mean = 7.78 mg N/L) but the levels are below the human health hazard of 10 mg/L and well below the surface water levels. This suggests that the high concentrations of nitrate in the streams is not naturally occurring (i.e. mineral formations). Thus, comprehensive watershed sampling efforts were undertaken on 8 January 1991, 18 February 1992 and 10 March 1992 to determine the source(s) of nitrate in Long Point Gully.

#### *Comprehensive Sampling*

Results of the comprehensive sampling are presented in Tables 3 - 5. The major nitrate source to Long Point Gully can be attributed to the area between Sites LPG5 and LPG6. On sampling dates 1/8/91 and on 2/18/92 the highest nitrate concentrations in the watershed were found at Site LPG5 (highlighted in Table 3). This indicates that there is a source of nitrate upstream from LPG5. The comprehensive sampling done on 3/10/92 indicates the area of highest nitrate input to the stream. The difference in nitrate concentrations between sites LPG5 and LPG6 definitively shows that the source occurs in the area between them. The nitrate value for LPG6 was 1.19 mg N/L while a short distance downstream at LPG5 the nitrate value was 21.51 mg N/L. Figure 3 illustrates the nitrate concentrations geographically on the 2/18/92 sampling date by showing the nitrate concentrations on a map of the sub-watershed. On 2/18/92 there was no flow at Site LPG6. Elevated levels of total phosphorus and TKN were also identified at Sites LPG4 and LPG5 (Table 4) which further supports the contention

that the area between LPG4 and LPG5 are the cause of increased nutrient concentrations in this watershed.

*What is the cause of elevated nitrate levels?* Agricultural sources of nitrate and total phosphorus could include manure and synthetic fertilizers. This small area between sites LPG5 and LPG6 is a corn field that is drained by a ditch running through it. Farming practices used in this field are the most likely causes of the high nitrate loadings to Long Point Gully and ultimately Conesus Lake. Although there was no visible evidence of manure spreading on the dates sampled, TKN is a measure of organic nitrogen which could be caused by manure spreading or portions of crops that are left in the field to degrade. The fact that total suspended solids are low at both Sites LPG5 and LPG6 indicates that the elevated nutrient concentrations in the stream are not caused by soil loss. During high flow periods, the runoff is mobilizing dissolved nutrients from the agricultural fields and transporting them to Conesus Lake.

This field should be targeted for Best Management Practices by the Livingston County Soil and Water Conservation District to reduce the levels of nitrates coming off this relatively small portion of the watershed. A simple change in farming practices may lead to a significant decrease in the nutrient load to Conesus Lake.

## NO NAME CREEK

No Name Creek had the second highest nitrate loading to Conesus Lake on an areal basis (Table 1). Comprehensive sampling was undertaken on two dates in 1992 in an attempt to determine the origin of the nitrate in the watershed. Results of comprehensive watershed analysis on No Name Creek are in Table 4 for 18 February 1992 and in Table 5 for 10 March 1992. Sites of sample collection are identified in Figure 2.

The major source of nitrate is located on the eastern-most branch between Maple Beach Road and Lee Road, between Sites NN7 and NN5 (Figure 2.) This branch of the creek is bounded entirely by land used in agriculture, including fields of corn, wheat and hay and a dairy farm located on the corner of Lakeville - Groveland Road and Lee Road.

Figure 4 shows a map of the No Name watershed with the nitrate concentrations for the 18 February sampling date on it. The highest nitrate concentration occurs at Site NN5 (6.78 mg N/L). Upstream from NN5, Site NN7 the nitrate value on 2/18/92

was 2.14 mg N/L, which suggests a nitrate source between Sites NN5 and NN7 is providing the nutrient to the stream and eventually to Conesus Lake.

A map showing nitrate concentrations for the sampling date 10 March 1992 is presented in Figure 5. Similar to the sampling date in February, the nitrate concentration increases dramatically between sites NN5 and NN7.

Other nutrients (total phosphorus and TKN) are also elevated in this stretch of the Creek. The highest TKN value recorded in this sampling was 3510  $\mu\text{g N/L}$  at site NN5 on 2/18/92, which more than doubled the next upstream site (NN7 - 1680  $\mu\text{g N/L}$ ) (Table 4). This coincided with the highest total phosphorus value at the same time (1636  $\mu\text{g P/L}$ ). Unlike the nitrate source, this particular source of organic nitrogen and phosphorus was not consistently observed and could be linked to a particular agricultural practice that occurs intermittently, manure spreading for example.

*What are the potential sources of nutrients to No Name Creek?* Phosphorus and organic nitrogen could be coming off the livestock lots due to poor waste management and retention, poor practices in manure spreading, or inorganic fertilization of cropland. The low levels of suspended solids indicate that the high nutrient levels are not due to soil erosion, further reinforcing the contention that the sources are soluble in water or are applied to the soil surface where they are washed off into the stream. As indicated by total suspended solids, there does appear to be some soil erosion in the field between NN4 and NN6 (Table 4 and Figure 4).

Table 2. Initial sampling on Long Point Gully. The map of the sites can be found on Figure 1. TKN = total kjeldahl nitrogen, TP = total phosphorus and SRP = soluble reactive phosphorus.

DATE	SITE	NITRATE (mg N/L)	TKN ( $\mu\text{g}$ N/L)	TP ( $\mu\text{g}$ P/L)	SRP ( $\mu\text{g}$ P/L)
12/4/90	LPG1	0.83	720	128.3	68.1
	LPG4	7.46	1,900	313.2	240.2
12/11/90	LPG1	5.41	400	43.1	39.1
	LPG5	17.71	70	97.1	91.8
12/18/90	LPG1	4.38	380	48.6	41.2
	LPG5	12.70	830	160.3	156.6
01/02/91	LPG1	5.24	370	64.5	53.5
	LPG5	16.52	1,640	443.3	413.9
	Well	7.60	240	20.7	20.7
01/08/91	LPG1	4.74	320	49.7	45.7
	LPG2	4.70	420	34.1	9.4
	LPG3	10.42	410	68.5	11.1
	LPG4	16.96	10	70.0	47.2
	LPG5	20.3	10	95.3	87.6
	Well	7.96	90	21.7	20.8

Table 3. Stress stream analysis for nitrate on Long Point Gully for three dates. Nitrate values are in mg N/L. A map of the sites can be found in Figure 1. In general, the site number increases further upstream. NS = not sampled.

SITE	DATES		
	1/8/91	2/18/92	3/10/92
LPG1	4.74	7.12	12.32
LPG2	4.70	6.88	9.73
LPG3	10.42	6.95	19.08
LPG4	16.96	10.38	24.45
LPG5	20.30	14.15	21.51
LPG6	NS	No flow	1.19

Table 4. Analytical results of stress stream analysis on 18 February 1992 on Long Point Gully and No Name Creek. TKN = total kjeldahl nitrogen, TP = total phosphorus, TSS = total suspended solids.

SITE	NITRATE (mg N/L)	TKN ( $\mu$ g N/L)	TP ( $\mu$ g P/L)	TSS (mg/L)
<b>No Name</b>				
NN1	3.86	790	50.7	1.9
NN2	6.01	980	57.9	3.0
NN3	2.15	740	16.4	2.0
NN4	1.92	570	30.0	10.0
NN5	6.78	3,510	1,636.4	9.1
NN6	1.04	770	60.8	27.3
NN7	2.14	1,680	373.1	4.7
NN8	1.10	790	20.7	2.9
<b>Long Point</b>				
LPG1	7.12	520	40.3	0.1
LPG2	6.88	570	40.7	2.5
LPG3	6.95	1,190	204.6	73.7
LPG4	10.38	2,540	441.8	169.9
LPG5	14.15	780	53.6	10.4

Table 5 . Analytical results of stress stream analysis on 10 March 1992 on Long Point Gully and No Name Creek. TKN = total kjeldahl nitrogen, TP = total phosphorus, TSS = total suspended solids.

SITE	NITRATE (mg N/L)	TKN (µg N/L)	TP (µg P/L)	TSS (mg/L)
No Name				
NN1	6.13	610	34.0	1.2
NN2	11.62	1,020	102.8	2.6
NN3	4.15	350	9.0	1.2
NN4	3.93	450	9.9	< 1.0
NN5	12.71	960	116.5	< 1.0
NN6	2.85	570	16.0	1.9
NN7	6.07	1,210	220.2	1.1
NN8	3.04	460	16.8	1.7
Long Point				
LPG1	12.32	590	34.5	4.1
LPG2	9.73	620	15.6	1.9
LPG3	19.08	420	41.5	4.9
LPG4	24.45	850	91.7	1.1
LPG5	21.51	1,150	122.1	1.4
LPG6	1.19	630	99.2	15.6

## RECOMMENDATIONS:

1. The Livingston County Soil and Water Conservation District should approach the farmers in the areas identified as nonpoint sources of nutrients to review the agriculture practices employed by them. Potential problem areas could include over-fertilization of cropland, poor timing of fertilization, poor choice of tillage practices, improper animal waste management, etc. Corrective action is often quite simple and may have dramatic effects in final nutrient loads to Conesus Lake

2. A best management practice could be designed for the affected area. Best management practices (BMP) have been used for reducing nonpoint source pollution and can be designed to reduce sediment and nutrient transport to streams and lakes. BMP's include agronomic practices such as conservation or reduced tillage, crop rotation, vegetative cover, crop residue, and nutrient management (Johengen *et al.* 1989, Haith 1975, NYSDEC 1986). They may also include structural devices such as grassed waterways, sediment retention basins, erosion control weirs and animal waste holding tanks. BMP's may also benefit the farmer in the long term by decreasing fuel and fertilizer costs and by improving soil productivity.

3. Other polluted sub-watersheds should be investigated and remediated. South McMillan, North McMillan and Hanna's Creeks are the sub-watersheds that have the highest nutrient impact on Conesus Lake. These three streams contribute approximately 60% of the total phosphorus and organic nitrogen (57.5% TP; 60.2% TKN) to Conesus Lake.

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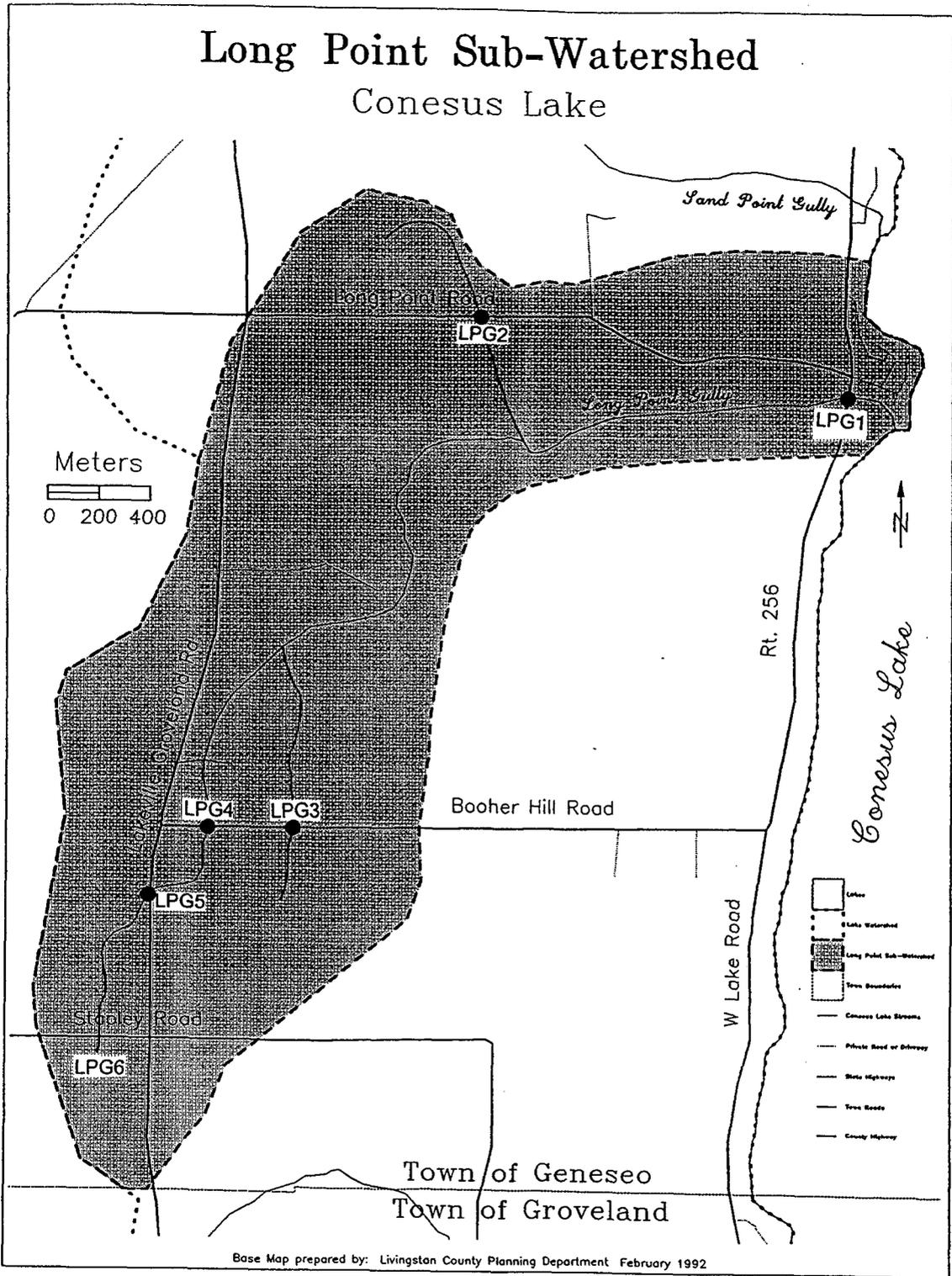


Figure 1. Long Point Gully sub-watershed with comprehensive sampling sites.

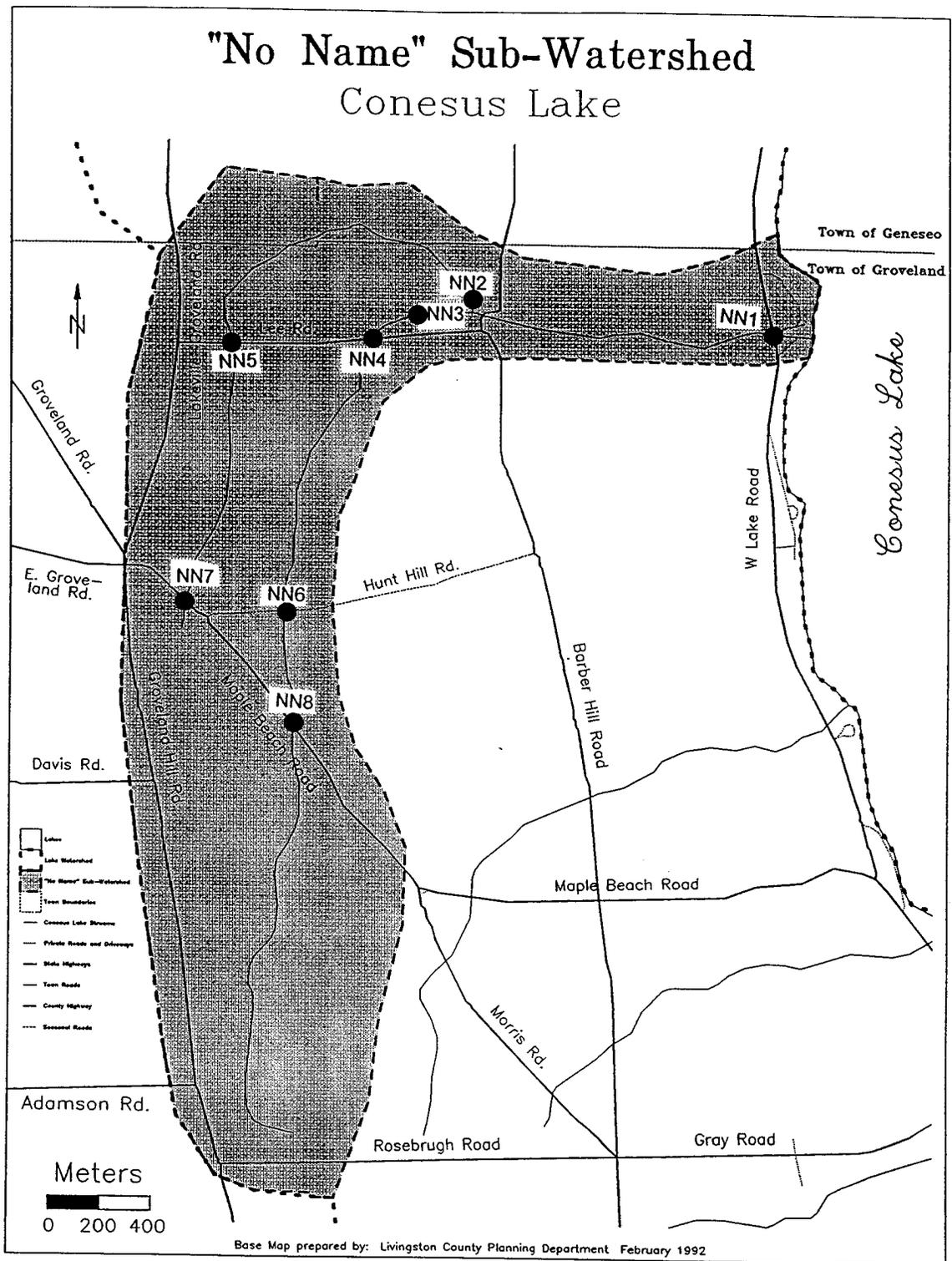
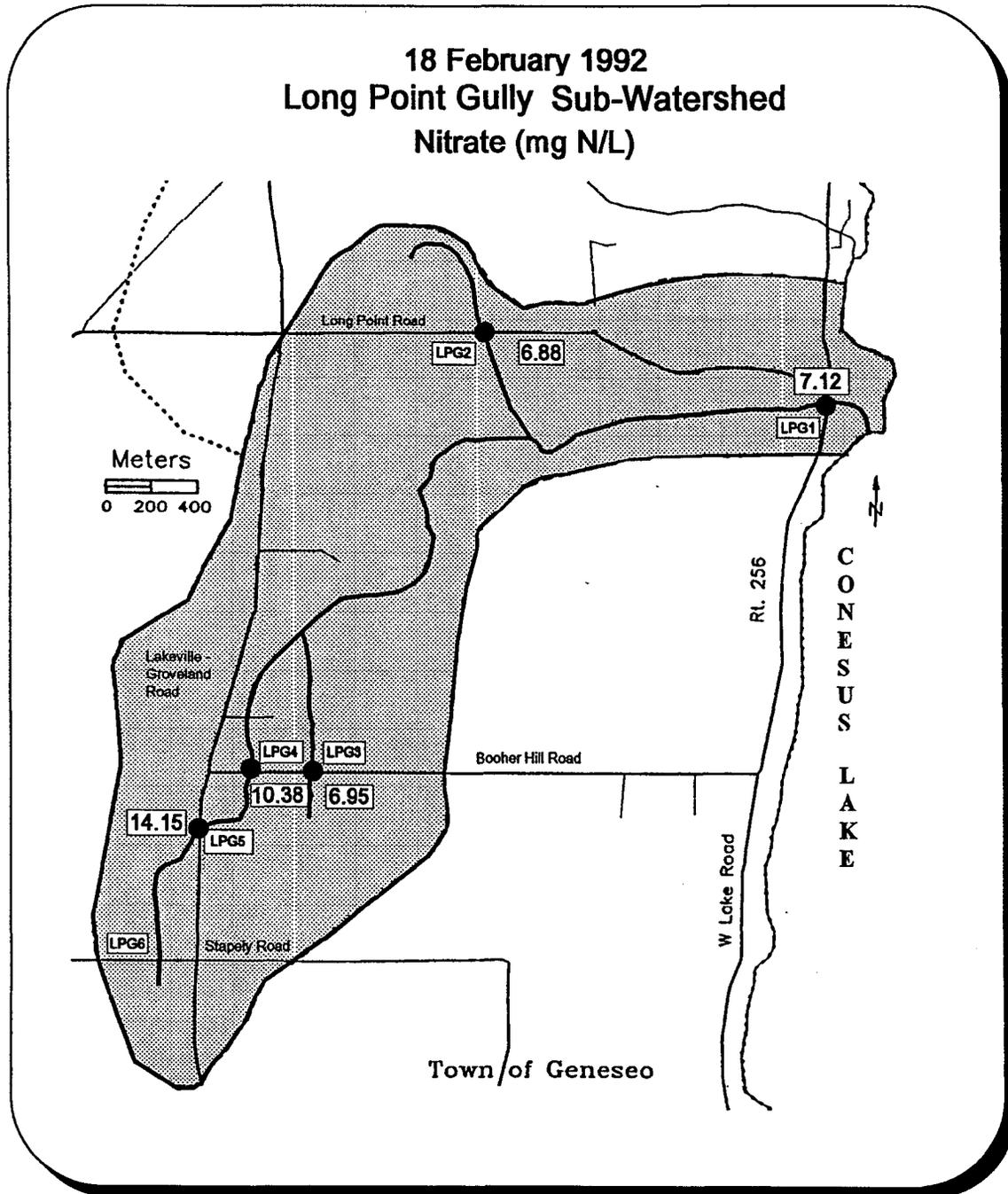


Figure 2. No Name Creek sub-watershed with comprehensive sampling sites.

Figure 3. Results of stress stream analysis for nitrate on 18 February 1992. Sampling occurred after a precipitation event coincident to the breakup of ice in the stream. Site LPG6 was still frozen and no flow was occurring.



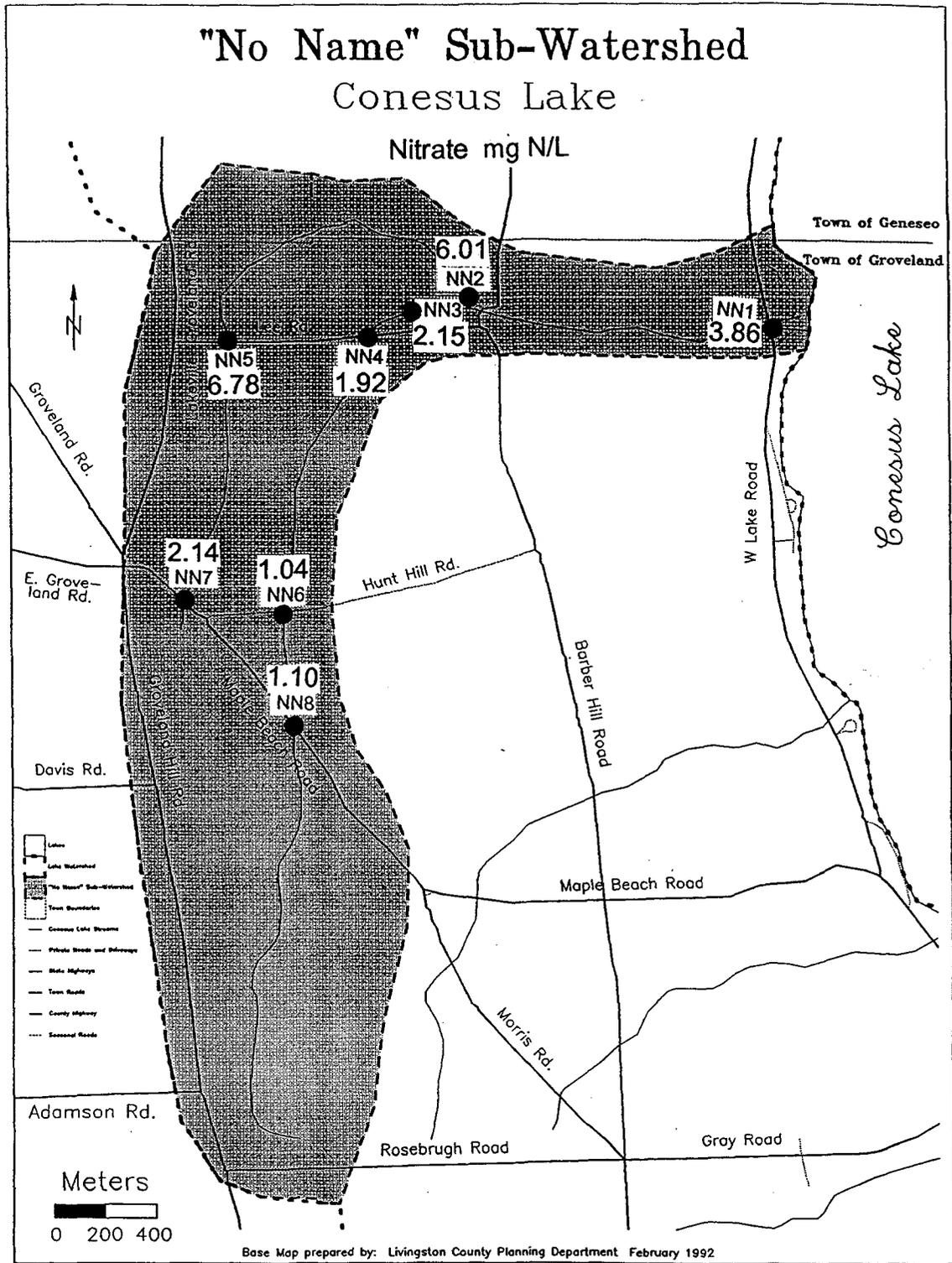


Figure 4. Results of stress stream analysis for nitrate on 18 February 1992. Sampling occurred during a precipitation event coinciding with the breakup of ice in the stream.

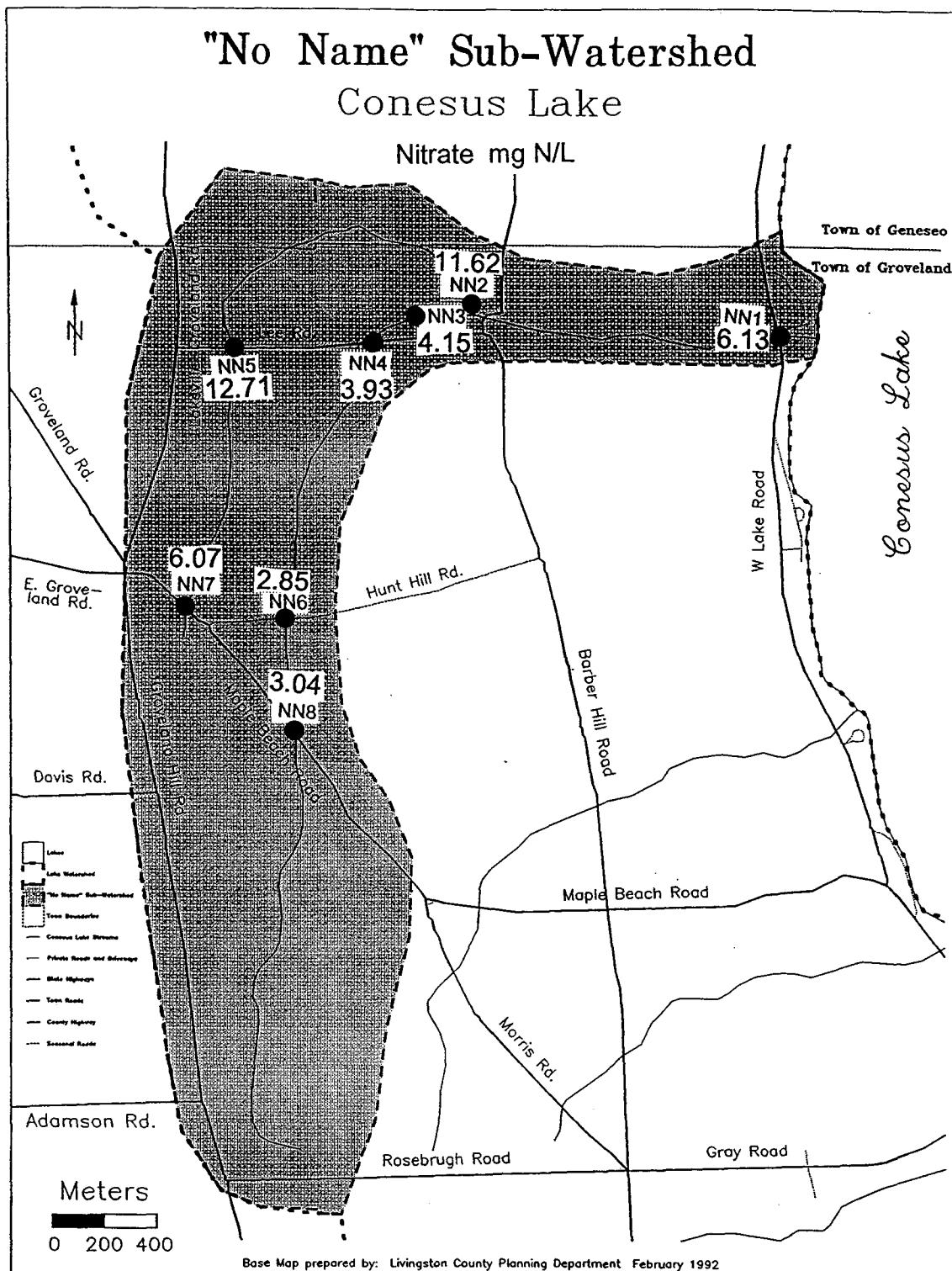


Figure 5. Results of stress stream analysis for nitrate on 10 March 1992. Sampling occurred during a precipitation event.