New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Owasco Lake Inlet

Biological Assessment

2006 Survey

New York State
Department of Environmental Conservation

Owasco Lake Inlet

BIOLOGICAL ASSESSMENT

Seneca-Oneida-Oswego Rivers Basin
Cayuga and Tompkins Counties, New York

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Stream: Owasco Lake Inlet, Cayuga and Tompkins Counties, New York

Reach: Above Groton to below Moravia, New York

NYS Drainage Basin: Seneca-Oneida-Oswego Rivers Basin

Background:

The Stream Biomonitoring Unit sampled Owasco Lake Inlet in Cayuga and Tompkins counties, New York, on July 6, 2006. The purpose of the sampling was to assess overall water quality and determine the extent and causes of nutrient enrichment in the stream.

In riffle areas at seven sites, a traveling kick sample for macroinvertebrates was taken using methods described in the Quality Assurance document (Bode et al., 2002) and summarized in Appendix I. The contents of each sample were field-inspected to determine major groups of organisms present, and then preserved in alcohol for laboratory inspection of a 100-specimen subsample from each site. Macroinvertebrate community parameters used in the determination of water quality included species richness, biotic index, EPT richness, and percent model affinity (see Appendices II and III). Expected variability of results is stated in Smith and Bode (2004). Table 3 provides a listing of sampling sites and Table 4 provides a listing of all macroinvertebrate species collected in the present survey. This is followed by macroinvertebrate data reports, including raw data from each site.

Thanks to Scott Cook, DEC Region 7, for his assistance in this survey.

Results and Conclusions:

1. Water quality in Owasco Lake Inlet ranged from non-impacted to moderately impacted based on resident macroinvertebrate communities. A substantial decline in water quality occurred downstream of the Groton (V) Wastewater Treatment Plant (WWTP) discharge.

2. The Nutrient Biological Index indicated the greatest effects of nutrient inputs downstream of the Groton (V) Wastewater Treatment Plant discharge. Effects diminished linearly from Groton to Moravia. This trend is similar to previous measurements of total phosphorus in the stream.

3. Based on the Biological Assessment Profile, the Nutrient Biotic Index, and Cayuga County phosphorus data, the Groton (V) WWTP is indicated to be the major source of phosphorus in Owasco Inlet. Upgrading of the Groton treatment plant to include phosphorus removal would be a major step toward reducing nutrient loading to Owasco Lake.

Discussion:

Owasco Lake Inlet begins north of Freeville, New York, and flows approximately 21 miles in a northwesterly direction before flowing into Owasco Lake north of Moravia. The stream was previously sampled by the Stream Biomonitoring Unit at Moravia in 2001, and was assessed as slightly impacted (Bode et al., 2004). The purpose of the present survey was to assess overall water quality in relation to nutrient enrichment in the stream. Excess nutrients, resulting in increased plant and algal growth, are of concern in Owasco Lake as the primary cause of eutrophication. Owasco Lake Inlet is cited in the NYSDEC Priority Waterbody Listing as being a significant source of nutrients to Owasco Lake (NYSDEC, 1996). To document this problem, water column sampling of phosphorus levels in the watershed was conducted by Cornell Cooperative Extension of Cayuga County (Fallone, 2005).

In the present study, water quality assessments in Owasco Lake Inlet ranged from non-impacted to moderately impacted based on macroinvertebrate communities. A substantial decline in water quality occurred downstream of the Groton (V) Wastewater Treatment Plant discharge, as indicated by the Biological Assessment Profile (Figure 1). The macroinvertebrate community at this site was dominated by tolerant aquatic worms and black fly larvae, and had a high similarity to the model for the type of community expected downstream of sewage treatment plant discharges (Table 1).

The Nutrient Biological Index (NBI) also indicated the greatest effects downstream of the Groton (V) WWTP discharge, with effects diminishing linearly from Groton to Moravia (Figure 2). NBI scores used in this figure were combined scores for phosphorus and nitrogen (Table 2). Since an NBI value of 6 or greater corresponds to eutrophic conditions (Appendix XI), all sites in Owasco Inlet are considered biologically eutrophic.

Phosphorus data compiled by a sampling program in the Cayuga and Owasco lakes watersheds were reported by Fallone (2005). These data, based on means of monthly sampling from May to October at five Owasco Inlet sites, show the highest levels of total phosphorus (TP) at the site downstream of the Groton (V) WWTP. This trend correlates well with the Nutrient Biological Index in highlighting the inputs of this facility (Figure 2, Table 2). Although high phosphorus levels decrease linearly downstream of Groton as phosphorus is consumed by bacteria, algae, and macrophytes, the levels at Moravia would very likely be much lower without the addition at Groton. Levels upstream of Groton, averaging 0.26 mg/l, are already considered high, and are likely contributed primarily by agricultural sources. Studies have shown that TP levels above 0.06 mg/l can cause detrimental changes to fish communities (Miltner and Rankin, 1998).

Based on the Biological Assessment Profile, the Nutrient Biotic Index, and Cayuga County phosphorus data, the Groton (V) WWTP is indicated to be the major source of phosphorus in Owasco Inlet. Upgrading of the Groton treatment plant to include phosphorus removal would be a major step toward reducing nutrient loading to Owasco Lake.

Overview of field data:

On July 6, 2006, Owasco Lake Inlet at the sites sampled was 3-20 meters wide, 0.2-0.3 meter deep, and had current speeds of 90-150 cm/sec in riffles. Dissolved oxygen was 9.1-11.8 mg/l, specific conductance was 369-479 µmhos, pH was 7.3-8.7 and temperature was 16.8-17.9 °C (62-64 °F). Measurements for each site are found on the field data summary sheets.

Figure 1. Biological Assessment Profile (BAP) of index values, Owasco Inlet, 2006. Values are plotted on a normalized scale of water quality. The line connects the mean of the four values for each site, representing species richness (SPP), EPT richness (EPT), Hilsenhoff Biotic Index (HBI), and Percent Model Affinity (PMA). See Appendix IV for more complete explanation.

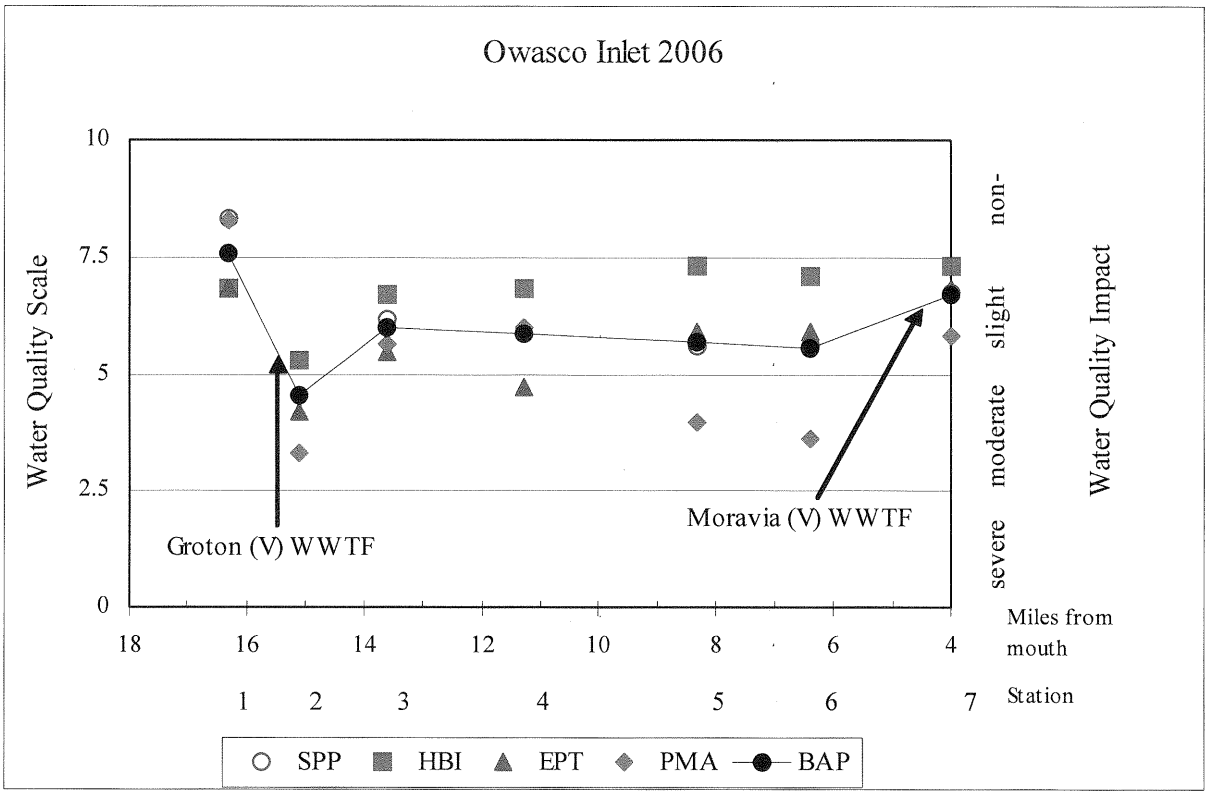


Figure 2. Nutrient Biotic Index (NBI) and total phosphorus (TP) values from Owasco Inlet. TP values are means of seven monthly values, May-October, 2004 (Fallone, 2005). NBI values are means for nitrogen and phosphorus (See Table 2).

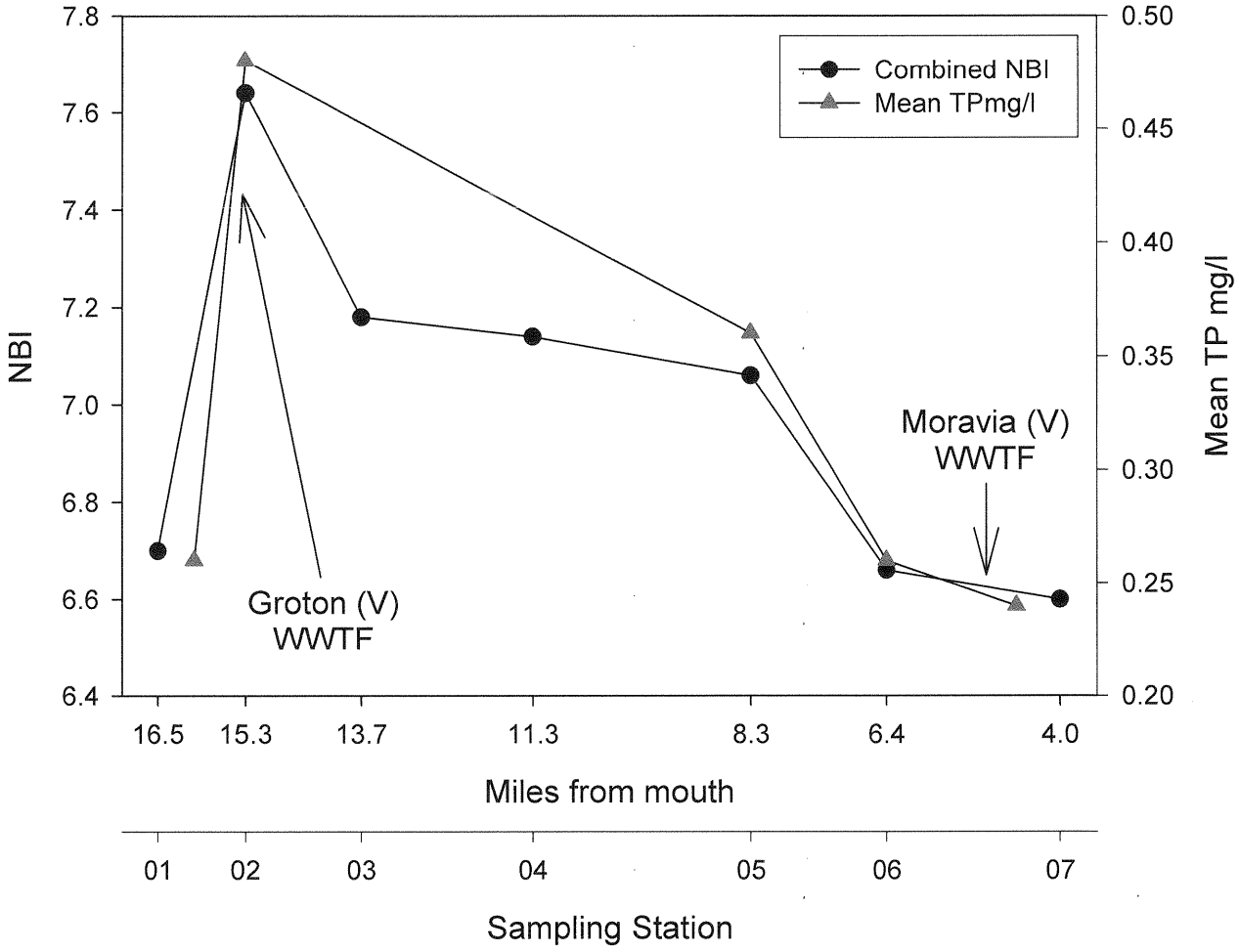


Table 1. Impact Source Determination, Owasco Lake Inlet, 2006. Numbers represent percent similarity to community type models for each impact category. Highest similarities at each station are shaded. Similarities less than 50 percent are less conclusive. Highest numbers represent probable type of impact. See Appendix X for further explanation.

	STATION						
Community Type	1	2	3	4	5	6	7
Natural: minimal human impacts	48	27	32	49	50	54	60
Nutrient additions: mostly nonpoint, agricultural	56	40	48	51	52	57	66
Toxic: industrial, municipal, or urban run-off	44	52	42	35	40	39	45
Organic: sewage effluent, animal wastes	33	64	36	39	30	32	36
Complex: municipal/industrial	43	48	53	43	29	34	35
Siltation	44	35	38	41	36	37	48
Impoundment	42	62	42	39	41	40	50

STATION	COMMUNITY TYPE
OWLI-01	Nutrient enrichment
OWLI-02	Organic (impoundment considered spurious)
OWLI-03	Complex, nutrient enrichment
OWLI-04	Nutrient enrichment, natural
OWLI-05	Nutrient enrichment, natural
OWLI-06	Nutrient enrichment, natural
OWLI-07	Nutrient enrichment

Table 2. NBI and TP values from Owasco Inlet. TP values are means of seven monthly values, May-October, 2004 (Fallone, 2005).

Miles from mouth	DEC Station Number	Cayuga Co. Station number	NBI-P	NBI-N	Combined NBI	Average Total Phosphorus
16.5	OWLI-01	-	6.38	7.01	6.70	-
16.0	-	OWL-604	-	-	-	0.26
15.3	OWLI-02	OWL-158	7.02	8.26	7.64	0.48
13.7	OWLI-03	-	7.16	7.20	7.18	
11.3	OWLI-04	-	7.16	7.11	7.14	-
8.3	OWLI-05	OWL-154	6.96	7.16	7.06	0.36
6.4	OWLI-06	OWL-112	7.24	6.07	6.66	0.26
4.6	-	OWL-111	-	-	-	0.24
4.0	OWLI-07	-	6.33	6.89	6.60	-

Literature Cited:

Bode, R. W., M. A. Novak, L. E. Abele, D. L. Heitzman and A. J. Smith, 2002, Quality assurance work plan for biological stream monitoring in New York State. New York State Department of Environmental Conservation, Technical Report, 115 pages.

Bode, R. W., M. A. Novak, L. E. Abele, D. L. Heitzman and A. J. Smith, 2004, Thirty-year trends in water quality of rivers and streams in New York State, based on macroinvertebrate data. New York State Department of Environmental Conservation, Technical Report, 384 pages.

Fallone, K., 2005, Total phosphorus sampling program for the Cayuga and Owasco Lake watersheds, 2004, Cornell Cooperative Extension of Cayuga County, 26 pages.

Miltner, R. J., and E. T. Rankin, 1998, Primary nutrients and the biotic integrity of rivers and streams, Freshwater Biology 40:145-158.

NYS DEC, 1996 (reprinted 2001), The 1996 Priority Waterbodies List for the Oswego-Seneca-Oneida River Basin. New York State Department of Environmental Conservation, Technical Report, 196 pages.

Smith, A. J. and R. W. Bode, 2004, Analysis of variability in New York State benthic macroinvertebrate samples. New York State Department of Environmental Conservation, Technical Report, 43 pages.

Table 3. Station Locations for Owasco Inlet, Cayuga and Tompkins Counties, New York

Station	Location
OWLI-01	Above Groton, NY at Peru Road bridge latitude 42°35'06" longitude 76°22'05" 16.3 stream miles above mouth
OWLI-02	Below Groton, NY at Walpole Road bridge latitude 42°35'56" longitude 76°22'23" 15.1 stream miles above mouth
OWLI-03	Below Groton, NY at Route 38 bridge latitude 42°37'05" longitude 76°23'03" 13.6 stream miles above mouth
OWLI-04	Above Locke, NY at Route 38 bridge latitude 42°38'32" longitude 76°24'28" 11.3 stream miles above mouth

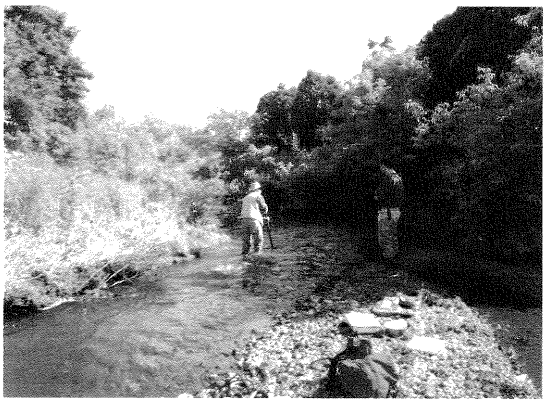
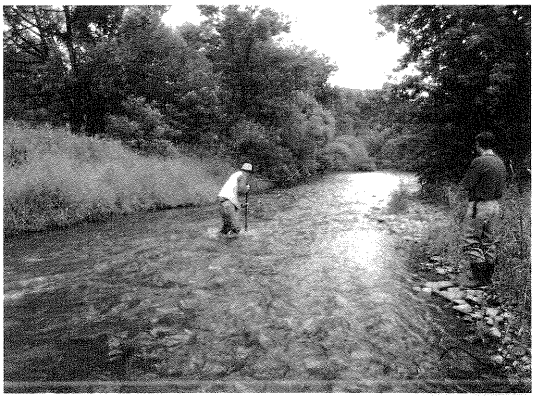
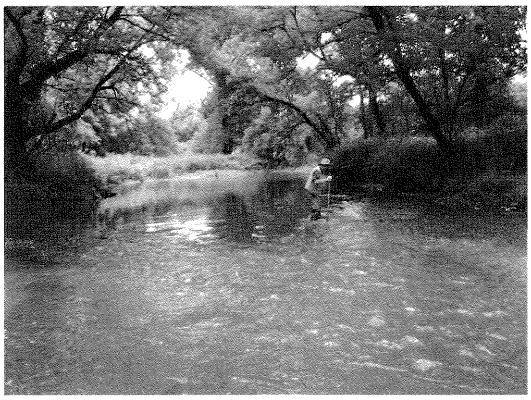


Table 3, continued

Station	Location
OWLI-05	Below Locke, NY at Route 38 bridge latitude 42°40'09" longitude 76°25'52" 8.3 stream miles above mouth
OWLI-06	Above Moravia, NY at Rounds Lane latitude 42°41'28" longitude 76°25'31" 6.4 stream miles above mouth
OWLI-07	Below Moravia, NY at Route 38 bridge latitude 42°43'00" longitude 76°26'14" 4.0 stream miles above mouth





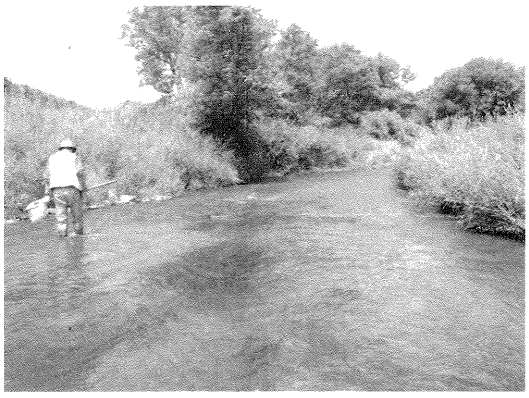


Figure 3	Watershed Overview	Owasco Inlet

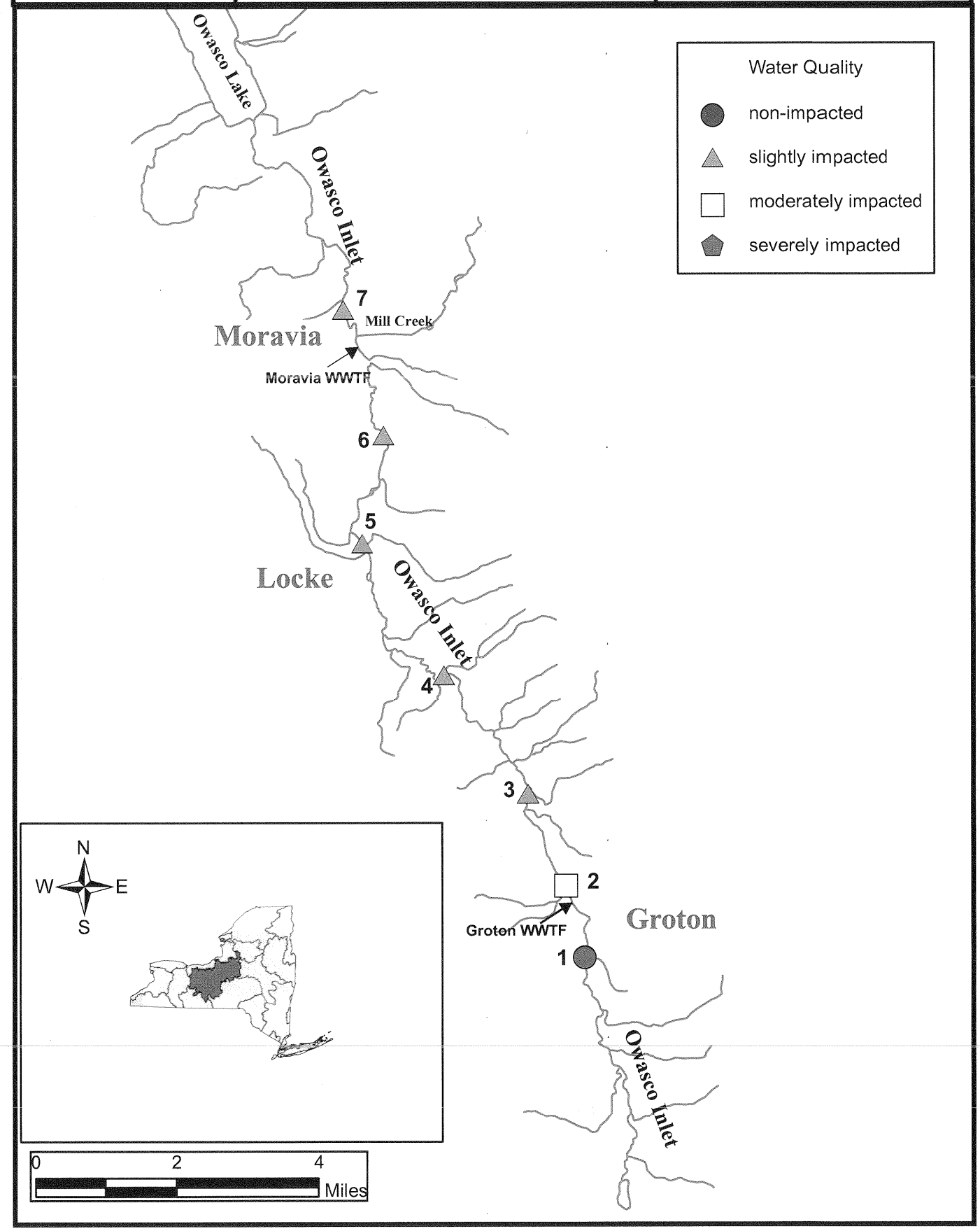


Figure 4a	Site Location Map	Owasco Inlet

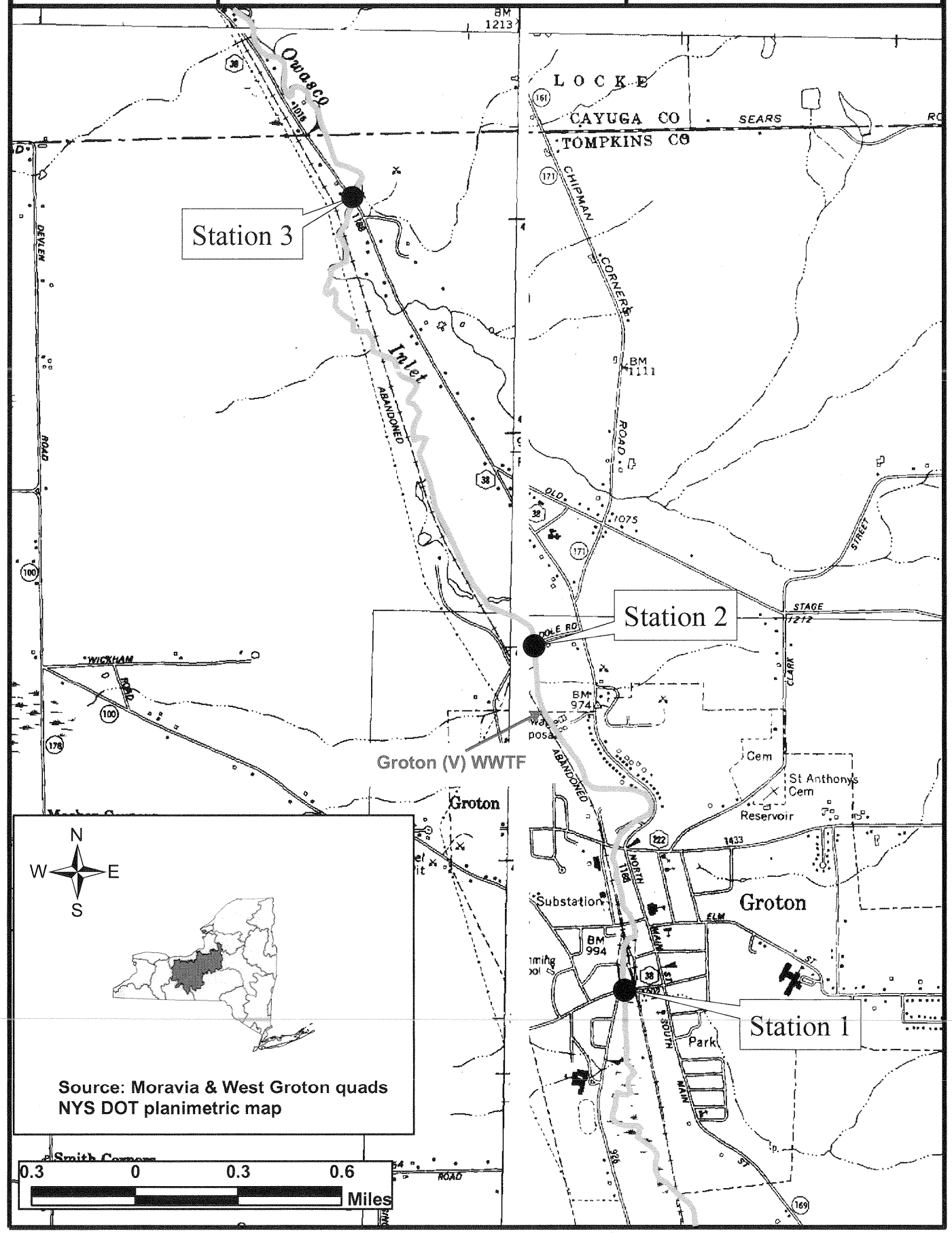
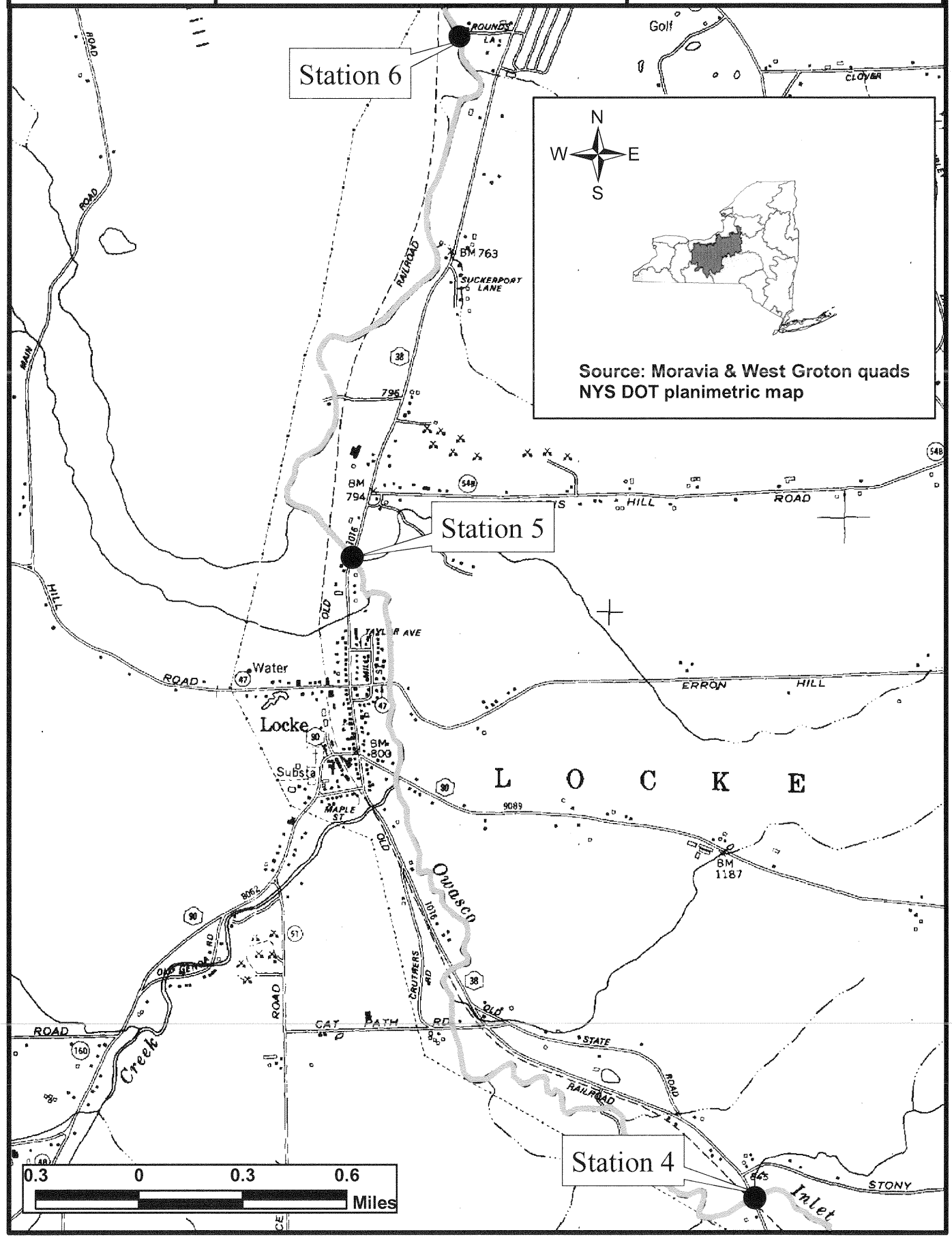
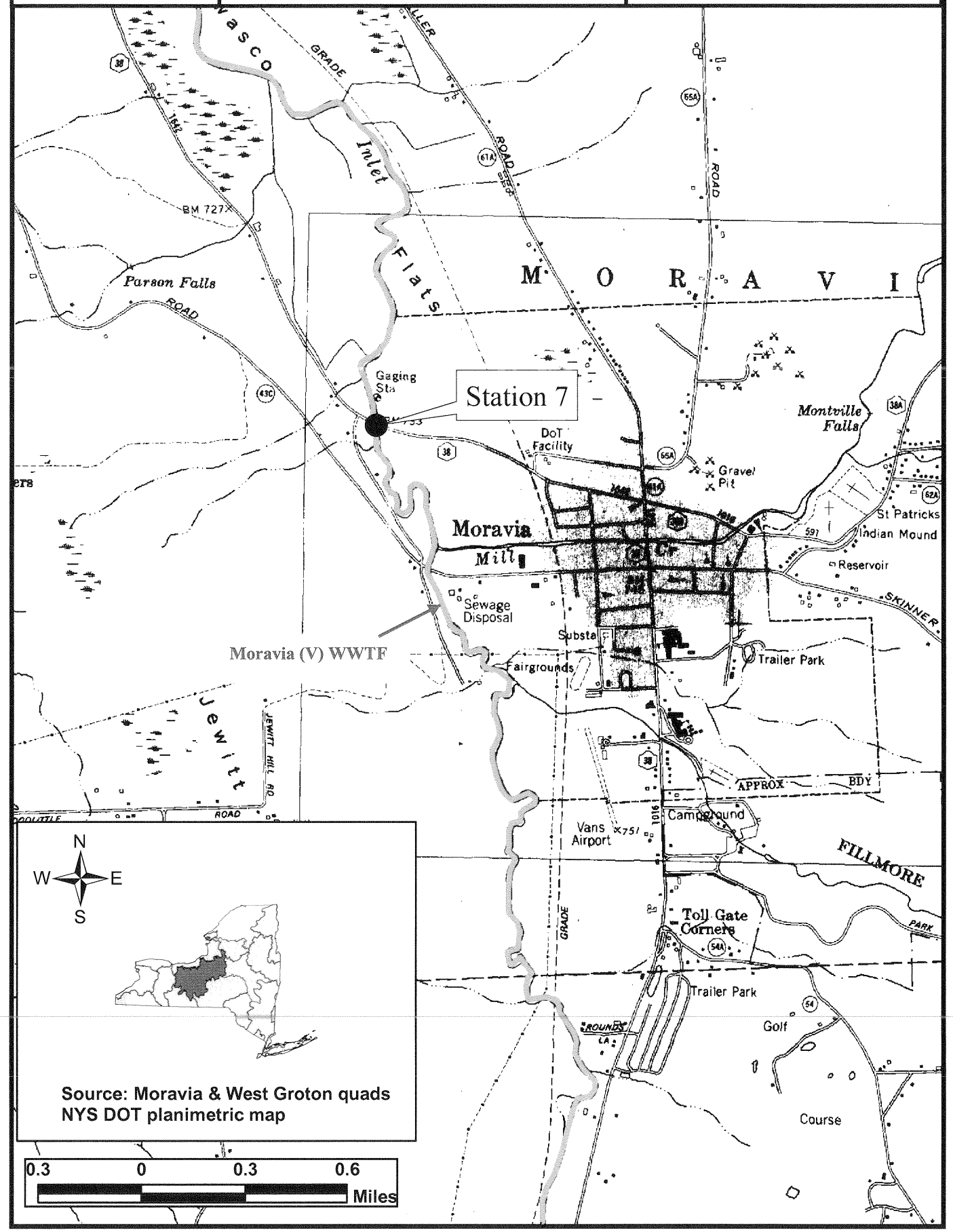


Figure 4b	Site Location Map	Owasco Inlet



↑ stream flow

Figure 4c	Site Location Map	Owasco Inlet



stream flow

Table 4. Macroinvertebrate Species Collected in Owasco Lake Inlet, Cayuga and Tompkins Counties, New York, 2006.

NEMERTEA
- Tetrastemmatidae
  - *Prostoma graecense*

PLATYHELMINTHES
- TURBELLARIA
  - Undetermined Turbellaria

ANNELIDA
- TUBIFICIDA
  - Enchytraeidae
    - Undetermined Enchytraeidae
  - Tubificidae
    - *Limnodrilus hoffmeisteri*
    - Undet. Tubificidae w/ cap. setae
  - Naididae
    - *Nais behningi*
    - *Ophidonais serpentina*

MOLLUSCA
- GASTROPODA
  - Physidae
    - *Physella sp.*
  - Ancylidae
    - *Ferrissia sp.*
- PELECYPODA
  - Sphaeriidae
    - *Sphaerium sp.*

ARTHROPODA
- CRUSTACEA
  - ISOPODA
    - Asellidae
      - *Caecidotea sp.*
  - AMPHIPODA
    - Gammaridae
      - *Gammarus sp.*

INSECTA
- EPHEMEROPTERA
  - Baetidae
    - *Acentrella* sp.
    - *Baetis flavistriga*
    - *Baetis intercalaris*
  - Heptageniidae
    - *Heptagenia marginalis*
    - *Leucrocuta sp.*
    - *Stenonema sp.*
  - Ephemerellidae
    - *Undetermined Ephemerellidae*
  - Tricorythidae
    - *Tricorythodes sp.*

PLECOPTERA
- Leuctridae
  - Undetermined Leuctridae
- Perlidae
  - *Agnetina capitata*
  - *Paragnetina immarginata*
- Chloroperlidae
  - Undetermined Chloroperlidae

COLEOPTERA
- Psephenidae
  - *Ectopria nervosa*
  - *Psephenus herricki*
- Elmidae
  - *Optioservus fastiditus*
  - *Optioservus ovalis*
  - *Optioservus trivittatus*
  - *Optioservus sp.*
  - *Oulimnius sp.*
  - *Promoresia elegans*
  - *Promoresia sp.*
  - *Stenelmis crenata*

TRICHOPTERA
- Philopotamidae
  - *Chimarra aterrima*
  - *Chimarra obscura*
  - *Chimarra socia*
- Psychomyiidae
  - *Psychomyia flavida*
- Hydropsychidae
  - *Cheumatopsyche sp.*
  - *Hydropsyche bronta*
  - *Hydropsyche slossonae*
  - *Hydropsyche sparna*

DIPTERA
- Tipulidae
  - *Antocha sp.*
  - *Dicranota sp.*
  - *Hexatoma sp.*
- Psychodidae
  - Undetermined Psychodidae
- Simuliidae
  - *Simulium vittatum*
- Athericidae
  - *Atherix sp.*
- Empididae
  - *Hemerodromia* sp.

Table 4, Continued.

Chironomidae

Thienemannimyia gr. spp.
Diamesa sp.
Pagastia orthogonia
Cardiocladius obscurus
Cricotopus bicinctus
Cricotopus tremulus
Cricotopus trifascia
Cricotopus sp.
Eukiefferiella devonica gr.
Parametriocnemus lundbecki
Rheocricotopus robacki
Synorthocladius nr. semivirens
Tvetenia vitracies
Cryptochironomus fulvus gr.
Microtendipes pedellus gr.
Polypedilum aviceps
Polypedilum fallax gr.
Polypedilum flavum
Polypedilum illinoense
Micropsectra sp.
Rheotanytarsus exiguus gr.

Macroinvertebrate Data Report: Raw Data.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-01
LOCATION:	Groton, NY, below Peru Road bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

PLATYHELMINTHES			
TURBELLARIA			
	Planariidae	Undetermined Turbellaria	2
ARTHROPODA			
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	12
		Baetis intercalaris	5
	Heptageniidae	*Stenonema sp.*	2
		Heptagenia marginalis	1
PLECOPTERA	Perlidae	*Agnetina capitata*	2
COLEOPTERA	Psephenidae	*Psephenus herricki*	2
	Elmidae	*Optioservus sp.*	11
		Oulimnius sp.	1
TRICHOPTERA	Philopotamidae	*Chimarra aterrima?*	6
	Hydropsychidae	*Cheumatopsyche sp.*	4
		Hydropsyche bronta	3
		Hydropsyche sparna	1
DIPTERA	Tipulidae	*Antocha sp.*	1
		Dicranota sp.	2
		Hexatoma sp.	3
	Simuliidae	*Simulium vittatum*	17
	Chironomidae	*Thienemannimyia gr. spp.*	2
		Diamesa sp.	3
		Pagastia orthogonia	1
		Cardiocladius obscurus	2
		Cricotopus bicinctus	1
		Cricotopus tremulus gr.	3
		Cricotopus trifascia gr.	3
		Parametriocnemus lundbecki	1
		Rheocricotopus robacki	1
		Microtendipes pedellus gr.	1
		Polypedilum flavum	3
		Micropsectra sp.	4

SPECIES RICHNESS:	29 (very good)
BIOTIC INDEX:	5.03 (good)
EPT RICHNESS:	9 (good)
MODEL AFFINITY:	72 (very good)
ASSESSMENT:	non-impacted (7.57)

DESCRIPTION: The kick sample was taken downstream of the Peru Road bridge (Route 38) in Groton. The habitat was considered good, and the macroinvertebrate fauna was diverse and well balanced, with mayflies, stoneflies, and caddisflies well represented. Based on the metrics, water quality was assessed as non-impacted.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-02
LOCATION:	Below Groton, NY, above Walpole Road bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

ANNELIDA			
OLIGOCHAETA			
TUBIFICIDA	Naididae	*Nais behningi*	40
		Ophidonais serpentina	2
	Tubificidae	Undet. Tubificid w/ cap. setae	2
MOLLUSCA			
GASTROPODA			
	Physidae	*Physella sp.*	1
ARTHROPODA			
CRUSTACEA			
ISOPODA	Asellidae	*Caecidotea sp.*	2
AMPHIPODA	Gammaridae	*Gammarus sp.*	2
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	6
		Baetis intercalaris	1
TRICHOPTERA	Hydropsychidae	*Hydropsyche bronta*	4
		Hydropsyche sparna	9
DIPTERA	Psychodidae	*Undetermined Psychodidae*	1
	Simuliidae	*Simulium vittatum*	23
	Chironomidae	*Cricotopus tremulus gr.*	1
		Cricotopus trifascia gr.	1
		Rheocricotopus robacki	1
		Polypedilum aviceps	1
		Polypedilum flavum	1
		Polypedilum illinoense	1
		Rheotanytarsus exiguus gr.	1

SPECIES RICHNESS:	19 (good)
BIOTIC INDEX:	6.27 (good)
EPT RICHNESS:	4 (poor)
MODEL AFFINITY:	39 (poor)
ASSESSMENT:	moderately impacted (4.52)

DESCRIPTION: The sampling site was estimated to be 200 meters downstream of the Groton (V) Sewage Treatment Plant discharge. A poor macroinvertebrate community was found, and was assessed as moderately impacted. Although mayflies, stoneflies and caddisflies were present, tolerant worms and blackflies dominated the sample. All metrics declined compared to those at upstream Station-1.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-03
LOCATION:	Below Groton, NY, at Route 38 bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

ARTHROPODA			
CRUSTACEA			
AMPHIPODA	Gammaridae	*Gammarus sp.*	7
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	5
		Baetis intercalaris	3
COLEOPTERA	Elmidae	*Optioservus sp.*	5
TRICHOPTERA	Hydropsychidae	*Cheumatopsyche sp.*	4
		Hydropsyche bronta	25
		Hydropsyche slossonae	1
		Hydropsyche sparna	4
DIPTERA	Tipulidae	*Antocha sp.*	2
		Dicranota sp.	3
	Simuliidae	*Simulium vittatum*	1
	Chironomidae	*Diamesa sp.*	12
		Pagastia orthogonia	5
		Cardiocladius obscurus	5
		Cricotopus bicinctus	2
		Cricotopus trifascia gr.	1
		Eukiefferiella devonica gr.	1
		Synorthocladius nr. semivirens	1
		Tvetenia vitracies	1
		Microtendipes pedellus gr.	2
		Polypedilum flavum	2
		Rheotanytarsus exiguus gr.	8

SPECIES RICHNESS:	22 (good)
BIOTIC INDEX:	5.14 (good)
EPT RICHNESS:	6 (good)
MODEL AFFINITY:	53 (good)
ASSESSMENT:	slightly impacted (6.00)

DESCRIPTION: This site was 1.6 miles downstream of the Groton (V) WWTF discharge. The macroinvertebrate community had partially recovered from the effects of the effluent discharge indicated at Station 2, with all metrics improving. Facultative midges and caddisflies dominated the community. All metrics were within the range of slightly impacted water quality.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-04
LOCATION:	Above Locke, NY, at Route 38 bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

NEMERTEA			
		Prostoma graecense	1
ANNELIDA			
OLIGOCHAETA			
TUBIFICIDA	Tubificidae	*Limnodrilus hoffmeisteri*	1
ARTHROPODA			
CRUSTACEA			
AMPHIPODA	Gammaridae	*Gammarus sp.*	2
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	2
		Baetis intercalaris	1
PLECOPTERA	Chloroperlidae	Undetermined Chloroperlidae	1
COLEOPTERA	Psephenidae	*Psephenus herricki*	4
	Elmidae	*Optioservus fastiditus*	11
		Optioservus trivittatus	11
		Stenelmis crenata	4
TRICHOPTERA	Hydropsychidae	*Hydropsyche bronta*	21
		Hydropsyche sparna	7
DIPTERA	Tipulidae	*Antocha sp.*	4
		Dicranota sp.	4
	Chironomidae	*Diamesa sp.*	12
		Cardiocladius obscurus	1
		Eukiefferiella devonica gr.	1
		Cryptochironomus fulvus gr.	1
		Microtendipes pedellus gr.	3
		Polypedilum fallax gr.	6
		Micropsectra sp.	2

SPECIES RICHNESS:	21 (good)
BIOTIC INDEX:	5.04 (good)
EPT RICHNESS:	5 (poor)
MODEL AFFINITY:	55 (good)
ASSESSMENT:	slightly impacted (5.85)

DESCRIPTION: The kick sample was taken downstream of the Route 38 bridge above Locke. The macroinvertebrate community was similar to that at Station-3, except more algal-scraping beetles were present at this site, and the riffle seemed to be more embedded with silt. The metrics were very similar to those at Station-3, and water quality was similarly assessed as slightly impacted.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-05
LOCATION:	Below Locke, NY, at Route 38 bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

PLATYHELMINTHES			
TURBELLARIA			
	Planariidae	Undetermined Turbellaria	2
ARTHROPODA			
CRUSTACEA			
AMPHIPODA	Gammaridae	*Gammarus sp.*	2
INSECTA			
EPHEMEROPTERA	Baetidae	*Acentrella sp.*	1
		Baetis intercalaris	4
PLECOPTERA	Leuctridae	Undetermined Leuctridae	1
	Perlidae	*Agnetina capitata*	1
COLEOPTERA	Psephenidae	*Ectopria nervosa*	1
		Psephenus herricki	9
	Elmidae	*Optioservus fastiditus*	32
		Promoresia elegans	1
		Stenelmis crenata	19
TRICHOPTERA	Hydropsychidae	*Hydropsyche bronta*	11
		Hydropsyche slossonae	1
		Hydropsyche sparna	3
DIPTERA	Tipulidae	*Dicranota sp.*	2
	Athericidae	*Atherix sp.*	2
	Empididae	*Hemerodromia sp.*	1
	Chironomidae	*Diamesa sp.*	3
		Cricotopus sp.	2
		Microtendipes pedellus gr.	2

SPECIES RICHNESS:	20 (good)
BIOTIC INDEX:	4.65 (good)
EPT RICHNESS:	7 (good)
MODEL AFFINITY:	43 (poor)
ASSESSMENT:	slightly impacted (5.69)

DESCRIPTION: The macroinvertebrate community at this site was heavily dominated by algal-scraping riffle beetles. Mayflies, stoneflies, and caddisflies were also present, but water quality was assessed as slightly impacted.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-06
LOCATION:	Above Moravia, NY, at Rounds Lane
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

PLATYHELMINTHES			
TURBELLARIA			
	Planariidae	Undetermined Turbellaria	2
ANNELIDA			
OLIGOCHAETA			
TUBIFICIDA	Enchytraeidae	Undetermined Enchytraeidae	1
	Tubificidae	*Limnodrilus hoffmeisteri*	1
MOLLUSCA			
PELECYPODA			
	Sphaeriidae	*Sphaerium sp.*	1
ARTHROPODA			
CRUSTACEA			
AMPHIPODA	Gammaridae	*Gammarus sp.*	11
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	2
		Baetis intercalaris	2
	Heptageniidae	*Stenonema sp.*	1
COLEOPTERA	Psephenidae	*Psephenus herricki*	7
	Elmidae	*Optioservus ovalis*	33
		Stenelmis crenata	16
TRICHOPTERA	Philopotamidae	*Chimarra obscura*	1
		Chimarra socia	1
	Hydropsychidae	*Hydropsyche bronta*	9
		Hydropsyche sparna	5
DIPTERA	Tipulidae	*Antocha sp.*	3
	Chironomidae	*Diamesa sp.*	1
		Pagastia orthogonia	1
		Tvetenia vitracies	1
		Cryptochironomus fulvus gr.	1

SPECIES RICHNESS:	20 (good)
BIOTIC INDEX:	4.83 (good)
EPT RICHNESS:	7 (good)
MODEL AFFINITY:	41 (poor)
ASSESSMENT:	slightly impacted (5.56)

DESCRIPTION: The sampling site was located at the end of Round Lane, upstream of Moravia. The habitat was adequate, although embeddedness was higher than at upstream sites. Metrics were very similar to those at Station-5, and water quality was similarly assessed as slightly impacted. Riffle beetles dominated the fauna, as at Station-5.

Macroinvertebrate Data Report: Raw Data, cont'd.

STREAM SITE:	Owasco Lake Inlet, Station OWLI-07
LOCATION:	Below Moravia, NY, below Route 38 bridge
DATE:	06 July 2006
SAMPLE TYPE:	Kick sample
SUBSAMPLE:	100 organisms

ANNELIDA			
OLIGOCHAETA			
TUBIFICIDA	Tubificidae	*Limnodrilus hoffmeisteri*	1
MOLLUSCA			
GASTROPODA			
	Ancylidae	*Ferrissia sp.*	1
ARTHROPODA			
CRUSTACEA			
ISOPODA	Asellidae	*Caecidotea sp.*	2
AMPHIPODA	Gammaridae	*Gammarus sp.*	3
INSECTA			
EPHEMEROPTERA	Baetidae	*Baetis flavistriga*	8
	Heptageniidae	*Leucrocuta sp.*	1
	Ephemerellidae	Undet. Ephemerellidae	1
	Leptohyphidae	*Tricorythodes sp.*	6
PLECOPTERA	Perlidae	*Paragnetina immarginata*	1
COLEOPTERA	Elmidae	*Optioservus fastiditus*	20
		Promoresia sp.	2
		Stenelmis crenata	23
TRICHOPTERA	Philopotamidae	*Chimarra obscura*	1
	Psychomyiidae	*Psychomyia flavida*	1
	Hydropsychidae	*Hydropsyche bronta*	4
		Hydropsyche sparna	12
DIPTERA	Tipulidae	*Antocha sp.*	5
	Simuliidae	*Simulium vittatum*	1
	Athericidae	*Atherix sp.*	1
	Chironomidae	*Thienemannimyia gr. spp.*	1
		Pagastia orthogonia	1
		Rheocricotopus robacki	1
		Tvetenia vitracies	2
		Polypedilum flavum	1

SPECIES RICHNESS:	24 (good)
BIOTIC INDEX:	4.65 (good)
EPT RICHNESS:	9 (good)
MODEL AFFINITY:	54 (good)
ASSESSMENT:	slightly impacted (6.68)

DESCRIPTION: Sampling was conducted a short distance downstream of Route 38, downstream of Moravia. The stream bottom was covered with abundant diatoms, filamentous algae, and macrophytes. The macroinvertebrate community contained mayflies, stoneflies, and caddisflies, but was dominated by riffle beetles, similar to the two upstream sites. Water quality was similarly assessed as slightly impacted.

LABORATORY DATA SUMMARY

STREAM NAME: Owasco Lake Inlet	DRAINAGE: 07
DATE SAMPLED: 7/6/2006	COUNTY: Cayuga & Tompkins

SAMPLING METHOD: Travelling Kick

STATION	01	02	03	04
LOCATION	Above Groton Peru Rd.	Below Groton Walpole Rd.	Below Groton Rte 38	Above Locke Rte 38
DOMINANT SPECIES/%CONTRIBUTION/TOLERANCE/COMMON NAME				
1.	Simulium vittatum	Nais behningi	Hydropsyche bronta	Hydropsyche bronta
	17 %	40 %	25 %	21%
	facultative	facultative	facultative	facultative
	blackfly	worm	caddisfly	caddisfly
2.	Baetis flavistriga	Simulium vittatum	Diamesa sp.	Diamesa sp.
Intolerant = not tolerant of poor	12 %	23 %	12 %	12 %
water quality	intolerant	facultative	facultative	facultative
	mayfly	blackfly	midge	midge
3.	Optioservus sp.	Hydropsyche sparna	Rheotanytarsus exiguus gr.	Optioservus fastiditus
Facultative = occurring over a	11 %	9%	8 %	11 %
wide range of water quality	intolerant	facultative	facultative	intolerant
	beetle	caddisfly	midge	beetle
4.	Chimarra aterrima?	Baetis flavistriga	Gammarus sp.	Optioservus trivittatus
Tolerant = tolerant of poor	6 %	6 %	7 %	11 %
water quality	intolerant	intolerant	facultative	intolerant
	caddisfly	mayfly	scud	beetle
5.	Baetis intercalaris	Hydropsyche bronta	Baetis flavistriga	Hydropsyche sparna
	5 %	4 %	5 %	7 %
	facultative	facultative	intolerant	facultative
	mayfly	caddisfly	mayfly	caddisfly
% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)				
Chironomidae (midges)	25.0 (12.0)	7.0 (7.0)	40.0 (11.0)	26.0 (7.0)
Trichoptera (caddisflies)	14.0 (4.0)	13.0 (2.0)	34.0 (4.0)	28.0 (2.0)
Ephemeroptera (mayflies)	20.0 (4.0)	7.0 (2.0)	8.0 (2.0)	3.0 (2.0)
Plecoptera (stoneflies)	2.0 (1.0)	0.0 (0.0)	0.0 (0.0)	1.0 (1.0)
Coleoptera (beetles)	14.0 (3.0)	0.0 (0.0)	5.0 (1.0)	30.0 (4.0)
Oligochaeta (worms)	0.0 (0.0)	44.0 (3.0)	0.0 (0.0)	1.0 (1.0)
Mollusca (clams and snails)	0.0 (0.0)	1.0 (1.0)	0.0 (0.0)	0.0 (0.0)
Crustacea (crayfish, scuds, sowbugs)	0.0 (0.0)	4.0 (2.0)	7.0 (1.0)	2.0 (1.0)
Other insects (odonates, diptera)	23.0 (4.0)	24.0 (2.0)	6.0 (3.0)	8.0 (2.0)
Other (Nemertea, Platyhelminthes)	2.0 (1.0)	0.0 (0.0)	0.0 (0.0)	1.0 (1.0)
SPECIES RICHNESS	29	19	22	21
BIOTIC INDEX	5.03	6.27	5.14	5.04
EPT RICHNESS	9	4	6	5
PERCENT MODEL AFFINITY	72	39	53	55
FIELD ASSESSMENT	Very Good	Poor	Good	Very good
OVERALL ASSESSMENT	Non	Moderate	Slight	Slight

LABORATORY DATA SUMMARY

STREAM NAME: Owasco Lake Inlet	**DRAINAGE: 07**
DATE SAMPLED: 07/06/2006	**COUNTY: Cayuga & Tompkins**

SAMPLING METHOD: Travelling Kick

STATION	05	06	07	
LOCATION	Below Locke Rte 38	Above Moravia End of Rounds Ln	Below Moravia Rte 38	
DOMINANT SPECIES/%CONTRIBUTION/TOLERANCE/COMMON NAME				
1.	Optioservus fastiditus	Optioservus trivittatus	Stenelmis crenata	
	32 %	33 %	23 %	
	intolerant	intolerant	facultative	
	beetle	beetle	beetle	
2.	Stenelmis crenata	Stenelmis crenata	Optioservus fastiditus	
Intolerant = not tolerant of poor	19 %	16 %	20 %	
water quality	facultative	facultative	intolerant	
	beetle	beetle	beetle	
3.	Hydropsyche bronta	Gammarus sp.	Hydropsyche bronta	
Facultative = occurring over a	11 %	11 %	12 %	
wide range of water quality	facultative	facultative	facultative	
	caddisfly	scud	caddisfly	
4.	Psephenus herricki	Hydropsyche bronta	Baetis flavistriga	
Tolerant = tolerant of poor	9 %	9 %	8 %	
water quality	intolerant	facultative	intolerant	
	beetle	caddisfly	mayfly	
5.	Baetis intercalaris	Psephenus herricki	Tricorythodes sp.	
	4 %	7 %	6 %	
	facultative	intolerant	intolerant	
	mayfly	beetle	mayfly	
% CONTRIBUTION OF MAJOR GROUPS (NUMBER OF TAXA IN PARENTHESES)				
Chironomidae (midges)	7.0 (3.0)	4.0 (4.0)	6.0 (5.0)	
Trichoptera (caddisflies)	15.0 (3.0)	16.0 (4.0)	18.0 (4.0)	
Ephemeroptera (mayflies)	5.0 (2.0)	5.0 (3.0)	16.0 (4.0)	
Plecoptera (stoneflies)	2.0 (2.0)	0.0 (0.0)	1.0 (1.0)	
Coleoptera (beetles)	62.0 (5.0)	56.0 (3.0)	45.0 (3.0)	
Oligochaeta (worms)	0.0 (0.0)	2.0 (1.0)	1.0 (1.0)	
Mollusca (clams and snails)	0.0 (0.0)	1.0 (1.0)	1.0 (1.0)	
Crustacea (crayfish, scuds, sowbugs)	2.0 (1.0)	11.0 (1.0)	5.0 (2.0)	
Other insects (odonates, diptera)	5.0 (3.0)	3.0 (1.0)	7.0 (3.0)	
Other (Nemertea, Platyhelminthes)	2.0 (1.0)	2.0 (1.0)	0.0 (0.0)	
SPECIES RICHNESS	20	20	24	
BIOTIC INDEX	4.65	4.83	4.65	
EPT RICHNESS	7	7	9	
PERCENT MODEL AFFINITY	43	41	54	
FIELD ASSESSMENT	Very good	Very good	Very good	
OVERALL ASSESSMENT	Slight	Slight	Slight	

FIELD DATA SUMMARY				
STREAM NAME: Owasco Lake Inlet	DATE SAMPLED: 7/6/2006			
REACH: Above Groton to Moravia				
FIELD PERSONNEL INVOLVED: Bode/Novak/Cook (DEC Region 7)				
STATION	01	02	03	04
ARRIVAL TIME AT STATION	9:20	9:50	10:20	11:00
LOCATION	Above Groton Peru Rd.	Below Groton Walpole Rd.	Below Groton Rte 38	Above Locke Rte 38
PHYSICAL CHARACTERISTICS				
Width (meters)	3.0	3.0	10	12
Depth (meters)	0.2	0.2	0.2	0.2
Current speed (cm per sec.)	110	125	100	90
Substrate (%)				
Rock (>25.4 cm, or bedrock)	0	0	0	0
Rubble (6.35 – 25.4 cm)	20	30	30	40
Gravel (0.2 – 6.35 cm)	40	30	30	30
Sand (0.06 – 2.0 mm)	20	20	20	10
Silt (0.004 – 0.06 mm)	20	20	20	20
Embeddedness (%)	20	20	30	30
CHEMICAL MEASUREMENTS				
Temperature (°C)	17.4	17.3	17.1	16.8
Specific Conductance (umhos)	369	479	442	427
Dissolved Oxygen (mg/l)	9.1	10.0	11.5	11.6
pH	7.3	7.8	8.4	8.6
BIOLOGICAL ATTRIBUTES				
Canopy (%)	20	30	0	90
Aquatic Vegetation				
algae – suspended				
algae – attached, filamentous	X	X	X	X
algae – diatoms	X	X	X	X
macrophytes or moss				
Occurrence of Macroinvertebrates				
Ephemeroptera (mayflies)	X	X	X	X
Plecoptera (stoneflies)	X	X	X	X
Trichoptera (caddisflies)	X	X	X	X
Coleoptera (beetles)	X		X	X
Megaloptera (dobsonflies, alderflies)	X		X	X
Odonata (dragonflies, damselflies)			X	X
Chironomidae (midges)	X		X	X
Simuliidae (black flies)		X		
Decapoda (crayfish)	X		X	
Gammaridae (scuds)		X	X	X
Mollusca (snails, clams)				
Oligochaeta (worms)				X
Other	X	X		
FAUNAL CONDITION	Very good	Poor	Good	Very good

FIELD DATA SUMMARY				
STREAM NAME: Owasco Lake Inlet	DATE SAMPLED: 7/6/2006			
REACH: Above Groton to Moravia				
FIELD PERSONNEL INVOLVED: Bode/Novak/Cook (DEC Region 7)				
STATION	05	06	07	
ARRIVAL TIME AT STATION	11:40	12:05	12:30	
LOCATION	Below Locke Rte 38	Above Moravia End of Rounds Ln	Below Moravia Rte 38	
PHYSICAL CHARACTERISTICS				
Width (meters)	8.0	10	20	
Depth (meters)	0.3	0.2	0.2	
Current speed (cm per sec.)	150	100	120	
Substrate (%)				
Rock (>25.4 cm, or bedrock)	0		0	
Rubble (6.35 – 25.4 cm)	40	40	40	
Gravel (0.2 – 6.35 cm)	30	30	30	
Sand (0.06 – 2.0 mm)	10	10	10	
Silt (0.004 – 0.06 mm)	20	20	20	
Embeddedness (%)	20	30	30	
CHEMICAL MEASUREMENTS				
Temperature (°C)	16.8	17.7	17.9	
Specific Conductance (umhos)	404	406	389	
Dissolved Oxygen (mg/l)	11.7	11.8	11.6	
pH	8.7	8.7	8.7	
BIOLOGICAL ATTRIBUTES				
Canopy (%)	10	70	0	
Aquatic Vegetation				
algae – suspended				
algae – attached, filamentous			X	
algae – diatoms	X	X	X	
macrophytes or moss			X	
Occurrence of Macroinvertebrates				
Ephemeroptera (mayflies)	X	X	X	
Plecoptera (stoneflies)	X	X	X	
Trichoptera (caddisflies)	X	X	X	
Coleoptera (beetles)	X	X	X	
Megaloptera (dobsonflies, alderflies)	X	X	X	
Odonata (dragonflies, damselflies)				
Chironomidae (midges)				
Simuliidae (black flies)				
Decapoda (crayfish)	X	X	X	
Gammaridae (scuds)	X	X	X	
Mollusca (snails, clams)			X	
Oligochaeta (worms)		X		
Other		X		
FAUNAL CONDITION	Very good	Very good	Very good	