New York State
Department of Environmental Conservation

Division of Water

30 Year Trends in Water Quality of Rivers and Streams in New York State

Based on Macroinvertebrate Data
1972 - 2002

George E. Pataki, Governor

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30 YEAR TRENDS IN WATER QUALITY OF RIVERS AND STREAMS IN NEW YORK STATE BASED ON MACROINVERTEBRATE DATA 1972-2002

2004

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SUMMARY

Since 1972 the Stream Biomonitoring Unit has been using benthic macroinvertebrate communities to monitor and assess water quality in New York State streams . The 20th anniversary of the Clean Water Act and of the Stream Biomonitoring Unit in 1992 provided the impetus for the first examination of temporal water quality trends in New York State. "20 Year Trends in Water Quality of Rivers and Streams in New York State based on Macroinvertebrate Data", published in 1993, provided a comprehensive summary of findings on rivers and streams of New York State and examined temporal trends in water quality from 1972 to 1992. The present effort, a companion to the 1993 report, follows up on that document and examines water quality trends in the State from 1992-2002.

Macroinvertebrates are larger-than-microscopic invertebrate animals that inhabit aquatic habitats; freshwater forms are primarily aquatic insects, worms, clams, snails, and crustaceans. They are widely used today as indicators of water quality. Benthic macroinvertebrate community data lends itself well to the discernment of temporal trends in water quality. In addition to the attributes inherent in biological monitoring, comparability of our data is aided by the advantages of similarity in sampling methods, sampling sites, and data analysis, as well as few personnel changes. The continuity within the Stream Biomonitoring Unit since 1972 has made possible temporal trend analysis that takes full advantage of the data collected in the 1972-2002 period.

From 1993 to 2002, the Stream Biomonitoring Unit sampled macroinvertebrates at 1532 sites on 917 streams in New York State. A great majority of these sites were not sampled prior to 1993, and thus are unavailable for determining water quality trends for the 1972-2002 period. Of the sites previously sampled, 278 allow temporal trend analysis.

However these most recently sampled sites do provide a positive picture of current water quality. Of the 1532 currently monitored sites (those sampled since 1992), 45% are assessed as non-impacted, 41% as slightly impacted, 13% as moderately impacted, and 1% as severely impacted. Since non-impacted and slightly impacted sites are considered to meet designated uses, fully 86% of the State's assessed waters are considered to support aquatic life uses.

The probable causes of impacts at those sites assessed as other than non-impacted are dominated by nonpoint source nutrient enrichment, affecting 52% of these sites. Other causes are: 15% complex (municipal/industrial inputs), 11% organic wastes (sewage and animal wastes), 6% toxicity, 6% impoundment, 5% siltation, and 5% undetermined.

With regard to water quality trends, 20% of the temporal trends sites improved since 1992, 19% declined, and 61% showed no change. Most of the improvements (64%) were attributable to improved treatment or elimination of municipal and/or industrial inputs. Most of the declines in water quality (63%) are found to be previously non-impacted sites that have declined due to nonpoint source nutrient enrichment. These account for 76% of the declines. A secondary cause of declined water quality is in the combined categories of organic wastes and municipal/industrial inputs, responsible for 24% of the declines overall. Many of these are considered to be caused by aging infrastructure, specifically wastewater treatment plants that were built or upgraded in the 1970's and 1980's, and are now functioning beyond capacity or at reduced levels of efficiency.

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INTRODUCTION

The Stream Biomonitoring Unit was begun in New York State in 1972 with the mandate of monitoring and assessing the water quality of the State's rivers and streams using benthic macroinvertebrate communities. Since then the Unit has sampled most of the major rivers and streams across the State, amassing a large amount of biological data. Most of the reports of these data have emphasized spatial trends in water quality, rather than temporal trends.

The 20th anniversary of the Clean Water Act in 1992 provided the impetus for the first examination of temporal biologically-based water quality trends in New York State. "Twenty Year Trends in Water Quality of Rivers and Streams in New York State Based on Macroinvertebrate Data," published in 1993, provided a comprehensive summary of findings on rivers and streams of New York State and examined temporal trends in water quality from 1972 to 1992. The present effort, a companion to the 1993 report, follows up on that document and examines water quality trends in the State from 1992-2002.

The biomonitoring begun in 1972 by the Stream Biomonitoring Unit and the Avon Pollution Investigations Unit was a pioneer effort in which few states were engaged. Today water quality monitoring - biological as well as chemical - is mandated by the Environmental Protection Agency, and most states have a biomonitoring program that uses benthic macroinvertebrate communities as water quality indicators. In New York State, the effort that began in 1972 was the second round of statewide biomonitoring surveys. The first was conducted by the Conservation Department in the 1926-1939 period, and documented many cases of severe pollution in the State's rivers and streams.

Biological monitoring as applied here refers to the use of resident benthic macroinvertebrate communities as indicators of water quality. Macroinvertebrates are larger-than-microscopic invertebrate animals that inhabit aquatic habitats; freshwater forms are primarily aquatic insects, worms, clams, snails, and crustaceans. Nearly all streams are inhabited by a community of benthic macroinvertebrates. The species comprising the community each occupy a distinct niche defined and limited by a set of environmental requirements. The composition of the macroinvertebrate community is thus determined by many factors, including habitat, food source, flow regime, temperature, and water quality. The community is presumed to be controlled primarily by water quality if the other factors are determined to be constant or optimal. Community components which can change with water quality include species richness, diversity, balance, abundance, and presence/absence of tolerant or intolerant species. Various indices or metrics are used to measure these community changes. Assessments of water quality are based on metric values of the community, compared to expected metric values. The complete rationale for biomonitoring, in addition to the methods for its application are contained in Appendices 1-10.

Benthic macroinvertebrate community data lends itself well to the discernment of temporal trends in water quality. In addition to the attributes inherent to biological monitoring, comparability of our data is aided by the advantages of similarity in sampling methods, sampling sites, and data analysis, as well as few personnel changes. The biomonitoring continuity within the Stream Biomonitoring Unit has made possible temporal trend analysis that takes full advantage of the baseline of data collected in the 1970's. Biological monitoring using community analysis of macroinvertebrates is only one branch of the overall water quality monitoring program. The other major parts are water column chemistry, sediment chemistry, toxicity testing, fish community analysis, and fish flesh analysis, and macroinvertebrate tissue analysis. The most comprehensive assessment of water quality is one which incorporates all of the above elements. Due to limited

resources, it is rarely possible to achieve such a complete assessment at most sites. The water quality assessments given in this report are based solely on macroinvertebrate data, and should be recognized as sometimes differing from comprehensive assessments based on sampling several aspects of the ecosystem.

SUMMARY OF WATER QUALITY TRENDS, 1993-2002

From 1993 to 2002, the Stream Biomonitoring Unit sampled macroinvertebrates at 1532 sites on 917 streams in New York State. Compared to sampling 721 sites on 170 streams for the 1972-1992 period, the last decade represents a major effort to increase the coverage of assessed waters and to provide a better overall picture of water quality in the State. A great majority of these sites were not sampled prior to 1993, and thus are unavailable for generating water quality trends for the 1972-2002 period. However, of the sites previously sampled, 278 allow temporal trend analysis.

With regard to selection of sampling sites, during the 1972-1992 period site selection was often skewed toward impacted stream reaches, and the inventory of assessments for that period was not representative of all flowing waters in the state. In 1996, an effort to move toward more complete coverage of all waters in the State led to a large increase in streams sampled, and also to the selection of sites that were not previously sampled, many of which were non-impacted. Thus the comparison of assessments of all sites from 1992 to 2002 showing an increase in the number of non-impacted sites partially reflects the site selection process.

Examining the current status of all assessed sites, 45% are assessed as non-impacted, 41% as slightly impacted, 13% as moderately impacted, and 1% as severely impacted (Figure 0-1). Whereas non-impacted and slightly impacted sites are considered to meet designated uses, fully 86% of the State's assessed running waters exhibit good water quality, and are considered to support aquatic life uses.

The 1992 water quality assessments showed 36% of sites as non-impacted, 46% slightly impacted, 14% moderately impacted, and 4% severely impacted.

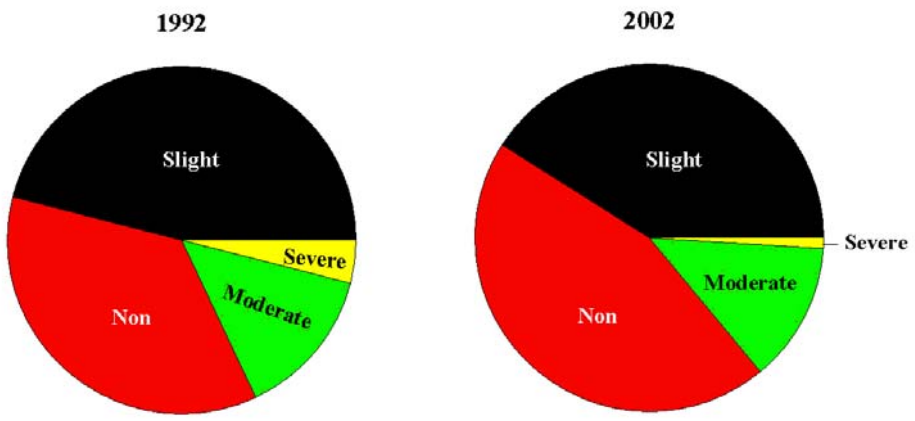


Figure 0-1. Assessed water quality at all sites, 1992 and 2002.

The probable causes of impairment are dominated by nonpoint source nutrient enrichment, affecting 52% of the currently assessed sites other than non-impacted sites. Other causes are: 15% complex (municipal/industrial inputs), 11% organic wastes (sewage and animal wastes), 6% toxicity, 6% impoundment, 5% siltation, and 5% undetermined (Figure 0-2). These probable causes of impairment were determined by Impact Source Determination, a method using faunal models empirically derived from macroinvertebrate data, first developed and applied by the Stream Biomonitoring Unit in 1994 and published in the scientific literature in 2002. Because the method was developed in 1994, no trend comparisons can be made to determine changes in causes of impact.

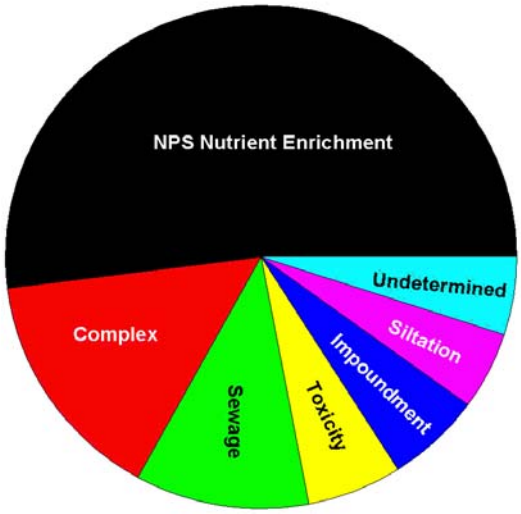


Figure 0-2. Causes of impact at impacted sites.

Water quality trends were determined by comparing assessments at the 278 temporal trends sites before and after 1992. Some of these comparisons are based on a limited number of site visits, and are considered provisional, subject to further monitoring and verification. The breakdown of trends for the 1992-2002 period is: 20% improved, 19% declined, and 61% showing no change. This represents a substantial change compared to trends observed in 1992, specifically an increase in the category of declined water quality (Figure 0-3). Of the improved sites, most (64%) were attributable to improved treatment or elimination of municipal and/or industrial inputs.

Examining the sites where water quality declined, most (63%) are attributable to previously non-impacted sites becoming slightly impacted, mostly (76%) through nonpoint source nutrient enrichment. A typical example of this is Ganargua Creek, in Wayne County. When this stream was sampled in 1974 and 1980, water quality was excellent. The site in Macedon was used as a model for non-impacted water quality. Ganargua Creek has its headwaters in the town of Victor, a rapidly growing suburb of Rochester. In the 1980's and 1990's, development increased along the creek, including the construction of a golf course. Subsequent sampling of the stream in 1995, 1996, 2001 and 2002 showed slightly impacted conditions from nonpoint source nutrient enrichment. The stream exhibits visible signs of enrichment at Macedon, often inundated with duckweed, filamentous algae, moss, and suspended algae.

A secondary cause of declines in water quality is in the combined categories of organic wastes and municipal/industrial inputs, responsible for 24% of the declines overall. Many of these declines are considered to be caused by aging infrastructure, specifically wastewater treatment plants that were built or upgraded in the 1970's and 1980's, and are now functioning beyond capacity or at reduced levels of efficiency.

An example of this type of decline is seen in the Genesee River in Rochester. The river upstream of the canal junction exhibited a substantial decline in water quality from 1989 to 1999. During the 1980's this site had shown greatly improved water quality following the 1977 upgrade of the Gates-Chili-Ogden Sewage Treatment Plant. The number of EPT species (mayflies, stoneflies, and caddisflies) illustrated this change, but these numbers returned to 1974 levels in 1999 (Figure 0-4), and water quality was assessed as severely impacted. This situation is likely to be reversed, since as of late 1999, all Monroe County wastewater treatment facilities now discharge into Lake Ontario.

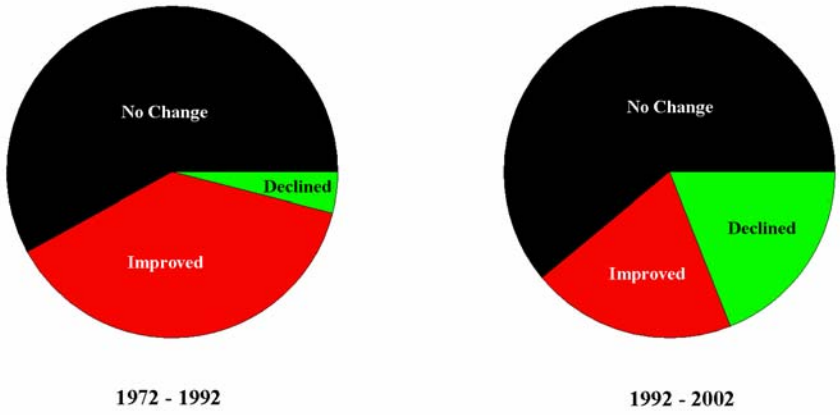


Figure 0-3. Water quality trends, 1972-1992 and 1992-2002.

The "20 year trends" document of 1993 included a list of ten "success stories," improved sites or reaches selected as exemplifying the most striking biological improvements in the State, and a list ten sites or reaches that exhibited severely impacted macroinvertebrate communities. They were included to focus on examples both of outstanding improvements and remaining problems. These lists, now updated to include data to 2002, are included here (Tables 1 and 2). The list of improved streams includes three segments that were on the 1993 list of severely impacted sites. The ten severely impacted streams are highlighted as substantial remaining water quality problems in New York State, as determined by the resident invertebrate fauna. Compared to the list of 1993, seven of the ten streams were removed from the original list, most following documented improvement.

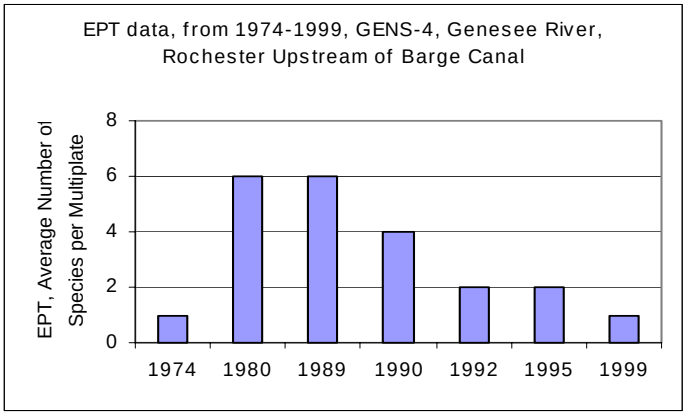


Figure 0-4. Clean-water mayflies, stoneflies, and caddisflies (EPT) in the Genesee River at Rochester, 1974-1999.

COMMENTS ON THE FUTURE OF BIOMONITORING AND STREAM WATER QUALITY IN NEW YORK STATE

In the past ten years biomonitoring efforts increasingly have been directed toward determination of cause of impact. The development of Impact Source Determination has been the

first step in this direction, allowing designation of broad categories such as “Municipal/industrial” and “Nonpoint source nutrient enrichment”. It is anticipated that further definition within these categories will be advanced. The use of diatom data may be useful in this endeavor. Monitoring of toxic contaminants in macroinvertebrate tissues will likely continue to play a substantial role in future biomonitoring, and the linking of body burdens with benthic community effects may assist in impact source determination.

Greater coverage of streams is envisioned, to include an even higher percentage of all named streams in the State. This can be accomplished through adding personnel to the program, changing the structure of sampling site selection or frequency, or reducing the intensity of sample processing at some sites. The latter option has been implemented in recent years through the implementation of field screening methods, which call for not processing samples at sites which pass screening. The aspect lost in this procedure is the capability of using the data for specific comparisons of metrics in tracking long-term trends.

Many of the sampling sites listed in this document had no prior data, so that temporal trend analyses could not include these sites. This underscores the need for good baseline data for making these comparisons. The capacity for comparing current data to historical data depends on continuity of methods. While some components of biological monitoring will change with more refined procedures and taxonomy, it is important to maintain continuity in the biological methods and sampling sites, in order to preserve comparability of data to the baseline of data established. Another integral part of this continuity is preservation or archiving of specimens, which can then be used for direct comparison with future collections

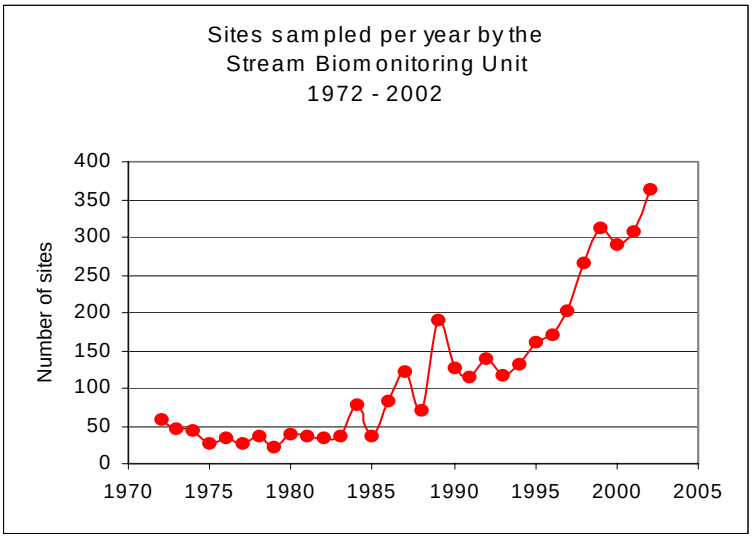


Figure 0-5. Sites sampled per year by the Stream Biomonitoring Unit, 1972-2002.

Biological monitoring during the 1972-1992 period using macroinvertebrates revealed many water quality changes. Most of the improvements were the result of increased treatment or elimination of single point discharges. Monitoring during the 1993-2002 period revealed additional improvements, but an equal number of declines in water quality, some attributable to aging infrastructure of the 1970's and 1980's, but more attributable to nonpoint source contributions. These include urban/suburban runoff, agricultural runoff, and atmospheric deposition. Nonpoint source contributions are expected to continue to exert a major influence on stream water quality. Maintaining aging infrastructure through available funding and NYSDEC technical assistance to municipalities must remain a priority for managing point source discharges, and preventing reversal of the gains in water quality in the 1970's and 1980's. This, and expanding development, changing land use, and the subsequent increase in impervious surfaces are seen as the greatest challenges of the future to water quality in New York State. Recent initiatives such as permitting stormwater discharges, along with continued funding of a wide range of other nonpoint source reduction programs and projects, are positive steps toward meeting these challenges.

TABLE 1. TEN SUCCESS STORIES: OUTSTANDING IMPROVEMENTS SINCE 1992.

1. Buffalo River, Buffalo

Water quality has continued to improve in the Buffalo River. Caddisflies were first collected in 1988, and more sensitive mayflies were first collected in 2000. The river has progressed from severely impacted to slightly impacted from 1976 to 2000, based on resident macroinvertebrate communities.

2. Barge Canal, Gasport

This site exhibited moderate impact in 1975 sampling, and has improved steadily since, displaying faunas of several species of mayflies and caddisflies. Diminished municipal/industrial inputs upstream is the likely cause of improvement.

3. Tioughnioga River, Cortland

Mayflies, stoneflies, caddisflies, and riffle beetles were found at this site in 1997, a substantial improvement over 1992 samples, when caddisflies, stoneflies, and riffle beetles were eliminated from the benthic fauna. Improvement is attributable to the 1995 change in sewage treatment process at the Cortland (C) Wastewater Treatment Facility.

4. Owasco Outlet, Auburn

Improvements in Owasco Outlet are linked to substantial upgrades in the Auburn (C) Sewage Treatment plant in 1995. Water quality in Owasco Outlet is currently assessed as slightly impacted at all sites.

5. Black River, Dexter

Multiplate sampling in 1997 and 2002 at this site showed substantial improvement, apparently resulting from the 1992 upgrade of the Dexter (V) Sewage Treatment Plant. The site exhibited moderately impacted water quality in 1986 and 1991 multiplate sampling, with high numbers of tolerant midges and worms reflecting organic inputs.

6. Upper Hudson River, Fort Edward to Waterford

Sampling in 2001 showed non-impacted water quality from Fort Edward to Waterford, with diverse macroinvertebrate communities of mayflies, stoneflies, and caddisflies. Improvement is attributed in part to improved treatment of upstream paper mill wastes. PCB levels in macroinvertebrate tissues remain high in the Upper Hudson River, contributing to elevated levels in fish.

7. Mohawk River, Fonda

Multiplate samples from this site that were dominated by sewage-tolerant worms in 1990 and 1995 were dominated by midges and mayflies in 2000. A possible reason for improvement is the 1991 upgrade of the Gloversville-Johnstown Wastewater Treatment Facility, which discharges into Cayadutta Creek, joining the Mohawk River at Fonda.

8. Patroon Creek, Albany

Improvements in Patroon Creek undoubtedly result from the termination of long-time raw sewage discharges into the stream. The occurrence of caddisflies (Trichoptera) in 1997 and riffle beetles (Coleoptera: Elmidae), mayflies (Ephemeroptera) in 1998, and stoneflies (Plecoptera) in 2002 are signs of continuing recovery in the stream. Known problems remain in the creek, leaving room for further improvement.

9. Ramapo River, Harriman

Macroinvertebrate sampling in 1986, 1991, 1993, and 1998 documented successive improvement in water quality following expansion in treatment capacity at the Orange County Sewer District # 1. The discharge currently has a minor and short-lived impact on the river's water quality.

10. Wawayanda Creek, Warwick

In 1994, the Warwick (V) Sewage Treatment Plant completed extensive upgrades. The downstream segment had been listed as one of the ten worst water quality problems in the State, based on sampling in 1989. Sampling in 1995 documented substantial recovery, with mayflies being found at the formerly severely impacted site.

TABLE 2. TEN REMAINING PROBLEMS: SEVERELY IMPACTED SITES

The following streams are highlighted as substantial remaining water quality problems in New York State, as determined by the resident invertebrate fauna. All exhibit severe biological impact.

1. Slater Creek, Rochester

Severely impacted water quality was assessed for this small stream in Greece, apparently caused by sewage wastes. The invertebrate fauna was dominated by sewage-tolerant worms, midges, snails, and sowbugs. The stream is proposed for inclusion in the draft Section 303(d) list of impaired waters.

2. Genesee River, Rochester

The Genesee River entering Rochester upstream of the canal junction has exhibited a substantial decline in water quality since 1992. The number of sensitive species (EPT) has now returned to 1974 levels, when water quality was assessed as severely impacted. This situation is likely to be reversed, since as of late 1999, Monroe County wastewater treatment facilities no longer discharge into the Genesee River.

3. Crane Brook, Montezuma

Severe impact was documented at this site in 2002, apparently caused by an unpermitted potato processing plant discharge. Specific conductance at the site was 6979 µmhos, and dissolved oxygen was only 0.8 mg/l. This situation is reported to be undergoing enforcement efforts.

4. Harbor Brook, Syracuse

Water quality appears unchanged from 1989 conditions, assessed as severely impacted. Conductance is very high, although some of this is likely of natural origin. The macroinvertebrate fauna is limited mostly to tolerant worms, midges, and snails. Stream habitat is also poor at this site. CSO abatement plans are underway to address these problems.

5. Ninemile Creek, Syracuse

Water quality remains very poor in this stream. Conductance is very high, dissolved oxygen is low, and the macroinvertebrate fauna is limited mostly to tolerant worms, midges, snails, scuds, and a few caddisflies. Stream habitat is also poor at this site. Talks are underway with Honeywell to address remedial actions for the creek.

6. Onondaga Creek, Syracuse

Water quality remains severely impacted at the Syracuse site, as in 1989. The macroinvertebrate fauna is composed entirely of tolerant worms and midges. Combined sewer overflows are the apparent cause of impact in this stream, and chlorides are very high. CSO abatement plans are underway to address these problems.

7. Hallocks Mill Brook, Amawalk

Downstream of the Yorktown Heights Wastewater Treatment Facility, the fauna clearly reflects impacts of organic wastes, exhibiting a reduced fauna of tolerant midges, worms, and leeches. Very high ammonium levels have also been documented at this site. The stream is proposed for inclusion in the draft Section 303(d) list of impaired waters.

8. Quaker Creek, Snufftown

Severe water quality impacts in Quaker Creek were measured in 1994 and 1995, downstream of the Florida (V) Sewage Treatment Plant. The greatest impacts occurred 3.3 miles downstream of the discharge, and were likely exacerbated by water withdrawals from the stream by local onion growers. The stream is proposed for inclusion in the draft Section 303(d) list of impaired waters.

9. Hutchinson River, Mount Vernon

The entire invertebrate fauna at this site consisted of 2 species of sewage-tolerant worms, pointing to a major sewage input in the half-mile reach above East Sanford Boulevard. The river is included in the Section 303(d) list of impaired waters.

10. Lemon Creek, Pleasant Plains (Staten Island)

The fauna in 1996 and 1998 consisted entirely of tolerant midges, worms, and snails. The problem is attributable to discharges of failing septic systems. Daytime dissolved oxygen at this site was only 3.7 ppm (42% saturation). Programs are underway installing sanitary sewers and handling storm flows, and should improve the quality of this waterbody in the future.

A CHRONOLOGY OF THE STREAM BIOMONITORING UNIT FROM 1992-2002

1992: Percent Model Affinity was published in the Journal of the North American Benthological Society, and began to be routinely used as a metric in New York State. 3 personnel, 138 sites sampled.

1993: "Twenty year trends in water quality of rivers and streams in New York State based on macroinvertebrate data" was completed. Doug Reed worked with the Unit as a Student Intern. A field screening procedure was developed and used. 3 personnel, 118 sites sampled.

1994: Impact Source Determination was developed to determine types of stress impacting stream water quality. 3 personnel, 132 sites sampled.

1995: Peter Mack left the Bureau; the Unit moved with the USGS to new facilities at Rensselaer Technology Park. The Unit gained computer access to the Internet. 3 personnel, 160 sites sampled.

1996: Maria Hanby worked with the Unit on a part-time basis. The Unit was transferred to the Bureau of Watershed Assessment and Research, under Italo Carcich. Fred Van Alstyne became Section Chief. 3 personnel, 166 sites sampled.

1997: Fish sampling was coordinated with macroinvertebrate Rapid Assessment sampling for several streams, in a cooperative effort with Doug Carlson. Diana Heitzman worked with the Unit on a part-time basis. 3 personnel, 203 sites sampled.

1998: GPS units began to be used routinely in field sampling. Steven Le Pennec worked for the Unit. 3 personnel, 266 sites sampled

1999: Diana Heitzman began working with the Unit on a permanent basis. Dr. Sophia Passy began in a post-doctoral position to develop diatom protocols for biomonitoring. Jeff Myers became Section chief. 4 personnel, 311 sites sampled.

2000: Diatom protocols for biomonitoring were developed by Sophia Passy. A. J. Smith worked with the Unit as summer intern. 4 personnel, 291 sites sampled.

2001: Digital microphotographs of invertebrates comprised a pictorial identification key produced for the DEC website by Larry Abele. The first all-digital stream assessment report was completed. A.J. Smith worked again as Summer Intern. Katie DeGoosh worked with the Unit on a Student Research project.
4 personnel, 308 sites sampled

2002: Alexander J. Smith began with the Unit on a permanent basis. Italo Carcich and Fred Van Alstyne retired. Sandi Allen became Division Director, Jeff Myers became acting Bureau Director, and Margaret Novak became acting Section Chief. Jessica Bennett worked with the Unit on a Student Research project. Impact Source Determination was published in the Northeastern Naturalist. Computerized data entry was developed for recording laboratory data directly. 5 personnel, 364 sites sampled.

The Stream Biomonitoring Unit, 2002. Left to right: Robert Bode, Margaret Novak, Lawrence Abele, Alexander Smith, Diana Heitzman.

A SUMMARY OF SOME BIOMONITORING CONCEPTS REFERRED TO IN THE TEXT. More complete descriptions of methods and a glossary are in the Appendices.

KICK SAMPLING: This is the method of sampling macroinvertebrates from wadeable streams with riffles. An aquatic net is positioned in the water at arm's length downstream and the stream bottom is disturbed by foot, so that the dislodged organisms are carried into the net. Sampling is continued for a specified time and for a specified distance in the stream.

MULTIPLATE SAMPLING: Multiplates (multiple-plate samplers) are artificial substrate sampling devices used in flowing waters considered too deep for kick sampling. Artificial substrates obtain a macroinvertebrate sample by providing a substrate for macroinvertebrate colonization for a fixed exposure period (5 weeks), after which the sampler is retrieved and the attached organisms are harvested. The use of artificial substrate samplers allows the comparison of results from different locations and times by providing uniformity of substrate type, depth, and exposure period. The sampler design is 3 square hardboard plates, separated by spacers, mounted on a turnbuckle. Samplers are usually hung from navigation buoys or floats.

ISD: Impact Source Determination (ISD) is the procedure used by the Stream Biomonitoring Unit for identifying types of impacts that exert deleterious effects on a waterbody. Impact Source Determination uses similarity to community types or models to ascertain one of seven primary factors influencing the fauna: organic wastes, toxic, sewage, nonpoint source nutrient enrichment, siltation, impoundment, or natural.

EPT: EPT denotes the total number of species of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) found in an average 100-organism subsample. These are considered to be mostly clean-water organisms, and their presence generally is correlated with good water quality.

LEVELS OF IMPACT: 4 levels of water quality impact are used: Non-impacted denotes very good water quality. Water quality is not limiting to fish survival or propagation. This level of water quality includes both pristine habitats and those receiving discharges which minimally alter the biota. Slightly impacted denotes good water quality. The macroinvertebrate community is slightly but significantly altered from the pristine state. Water quality is usually not limiting to fish survival, but may be limiting to fish propagation. Moderately impacted denotes poor water quality. The macroinvertebrate community is altered to a large degree from the pristine state. Water quality often is limiting to fish propagation, but usually not to fish survival. Severely impacted denotes very poor water quality. The macroinvertebrate community is limited to a few tolerant species. Water quality is often limiting to both fish propagation and fish survival.

FIELD SCREENING: Biological assessments at some sites are on-site determinations. If a determination is made that water quality is apparently free of impacts, no further sampling or sample analysis is required. If the assessment results in an assessment other than non-impacted, the sample is preserved for laboratory processing. The screening method uses on-site examination of the sample to determine if five criteria are met. If these are met, the site is determined to be non-impacted.

EXPLANATION OF COMPONENTS OF THIS DOCUMENT

Arrangement by drainage basin

Materials in this document are arranged in numerical order by drainage basin. Drainage basins are numbered from 1 to 17, generally west to east across New York State (Figure 0-6). Each section contains a map of the sampling sites, a list of sampling sites, assessments of water quality at all sites, reports of macroinvertebrate water quality studies within the basin, and a stream-by-stream narrative of all streams sampled in the last ten years.

Map of sampling sites

The maps include all sites within the drainage basin that were sampled by the Stream Biomonitoring Unit between 1992 and 2002. Sites that were not sampled in the last ten years are not included since they have no recent biological assessment. Water quality assessments for sites range from non-impacted to severely impacted, as determined by macroinvertebrate community indices. These assessments may not be the same as assessments based on water column or sediment data.

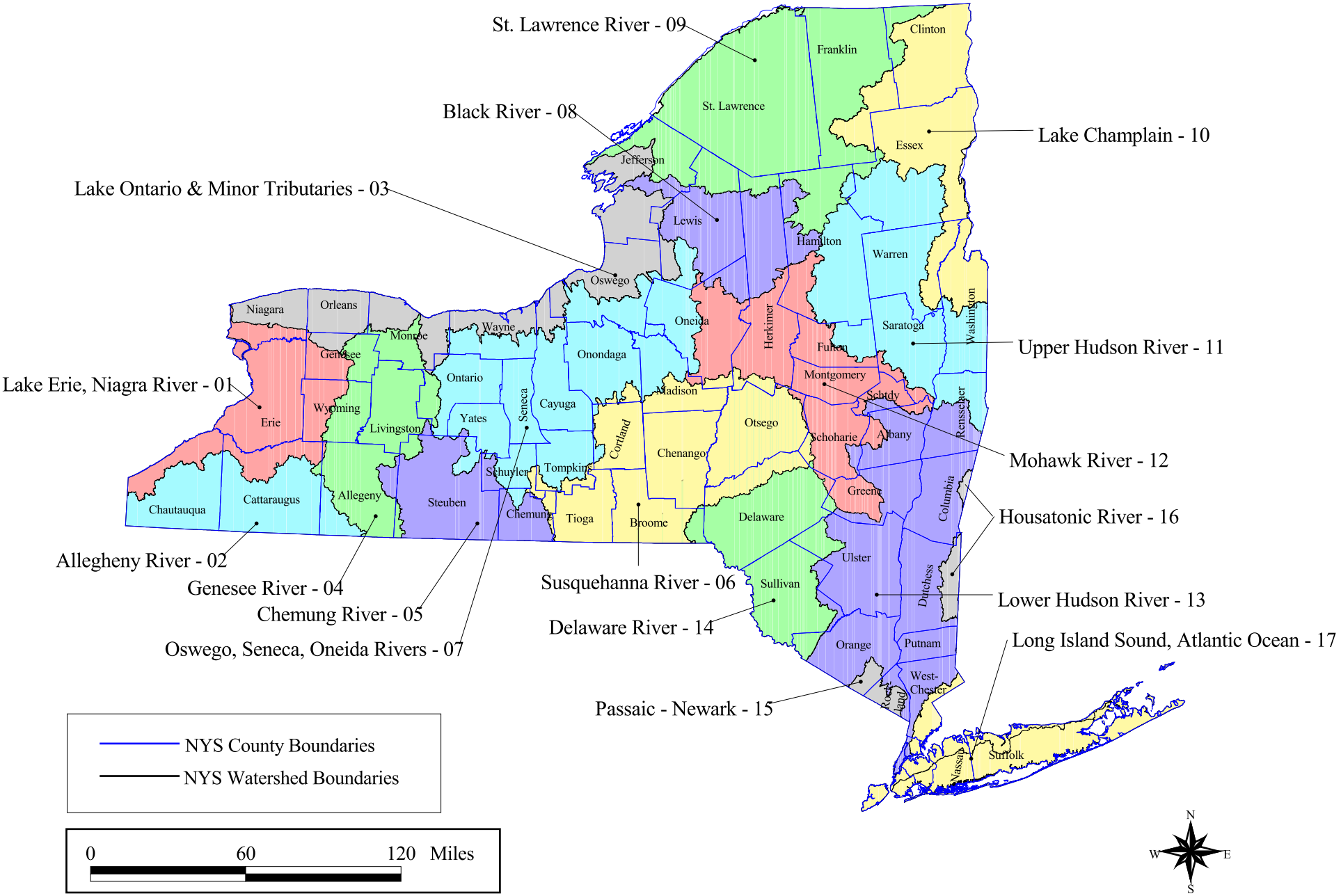
List of sampling sites

All sites sampled by the Stream Biomonitoring Unit between 1972 to 2002 are listed, with the year sampled (e.g. 82 = 1982). This list does not contain sampling by the NYS DEC Avon Pollution Investigations Unit. Station numbers with four-letter identifiers are Stream Biomonitoring Unit identification numbers and codes. Codes for some tributaries are those of the larger stream which it flows into (e.g. the code for the Raquette River is STLW, the St. Lawrence River code). Station numbers proceed from upstream to downstream; station numbers for some tributaries were originally assigned as part of the larger stream numbering system (e.g. Grass River station numbers are 13-14).

Assessments of water quality

Temporal trends in water quality are given for sites in the last ten years, ranging from non-impacted to severely impacted. Under “Change from 1992" a site is listed as either improved, declined, no change, or no prior data, the latter used for sites not sampled prior to 1993.

Reports of water quality

This list includes known reports of macroinvertebrate sampling within the drainage basin. Information on obtaining these is found at the end of this document. Reports designated as New York State Department of Health represent work of the Stream Biomonitoring Unit from 1972 to 1986, before the Unit was transferred to the New York State Department of Environmental Conservation.

New York State Drainage Basins