RIVERWATCH QUALITY ASSURANCE REPORT FOR 2005

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Introduction

The year 2005 saw an abbreviated RiverWatch (RW) program, with Friends of the Fox River (FFR) acting as lead organization. Funds were provided by Lt. Governor Quinn's office to help support management and quality assurance of the program.

During the summer, 132 stream sites were visited by volunteers. Most volunteers conducted their work as usual, sending in datasheets and samples as voucher to FFR for processing. Dr. R. Edward DeWalt of the Illinois Natural History Survey (INHS) conducted quality assurrance of the macroinvertebrate samples. A report on quality assurance is present here.

Methods

Samples, datasheets, and a spreadsheet sample log were turned over to Dr. DeWalt in October, 2005. The spreadsheet log contained 132 records. Some volunteers collected samples but submitted blank data sheets. We have not the time nor the resources to identify the samples for volunteers. Frequently, samples were not sent in for quality assurance. There is no way to verify these data and these records were eliminated from analysis. Still others went to the trouble of collecting the samples, but did not properly preserve them so that when identification was attempted, the specimens were so degraded as to be useless. Other volunteers were not known to us (not formally trained and entered into our database of volunteers) or the site they sampled was not formally assigned a site number. All of these data were eliminated from the analysis. What remained were 99 verifiable units. Of these, 49 samples, or 49.5%, were quality assured, exceeding the normal 30% conducted by RW in the past.

Macroinvertebrates were removed from their containers and the taxa and their abundances tallied on the original data sheets in red pencil. A database was created to record both volunteer and expert determined sample abundance, total taxa richness (TTR), Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa richness, and Macroinvertebrate Biotic Index (MBI) values. Additionally, percentage difference was calculated for these variables. Averages of these variables will not reveal much difference between volunteers and experts, but construction of a frequency histogram of the number of samples that fell within categories (0-10, 10-20, 20-30%) would be telling. Those volunteer responses that were within an absolute difference of 10% of the expert value were deemed acceptable. This is an arbitrary cutoff, and may be too stringent for this application, however, it is one widely employed by state and federal agencies who do stream sampling. Averages and ranges were calculated for abundance, TTR, EPT, and MBI and are expressed in the text. As a reminder,

Table 1 provides RiverWatch tentative quality ratings, and their qualitative ranks, that have been in use since 2004.

Table 1. Tentative quality rankings and quantitative rating scheme for three RiverWatch stream condition metrics. Scheme adopted in 2004.

Quality Ranking	Total Taxa Richness	EPT Richness	MBI
Excellent	≥14	≥5	≤4.35
Good	12-13	4	≥4.36-≤5.00
Fair	9-11	3	≥4.01-≤5.70
Poor	7-8	2	≥5.71-≤6.26
Very Poor	≤6	0-1	≥6.25

Results

Sample Abundance.-Volunteer samples averaged 112.4 organisms and ranged from 7 to 319. This average exceeded by 12% the minimum abundance sought by the RiverWatch program. Expert average abundance was numerically identical, with a range of 8 to 319. The average percentage difference for abundance was -0.36. A frequency histogram of percentage difference categories demonstrated that this average was not a useful story (Fig. 1). A relatively few volunteers got the abundance exactly right. One volunteer underestimated abundance by >40%, while the remainder had absolute differences of 10-30%. Overall, 39 samples (76.9%) produced abundances within the 10% absolute difference range.

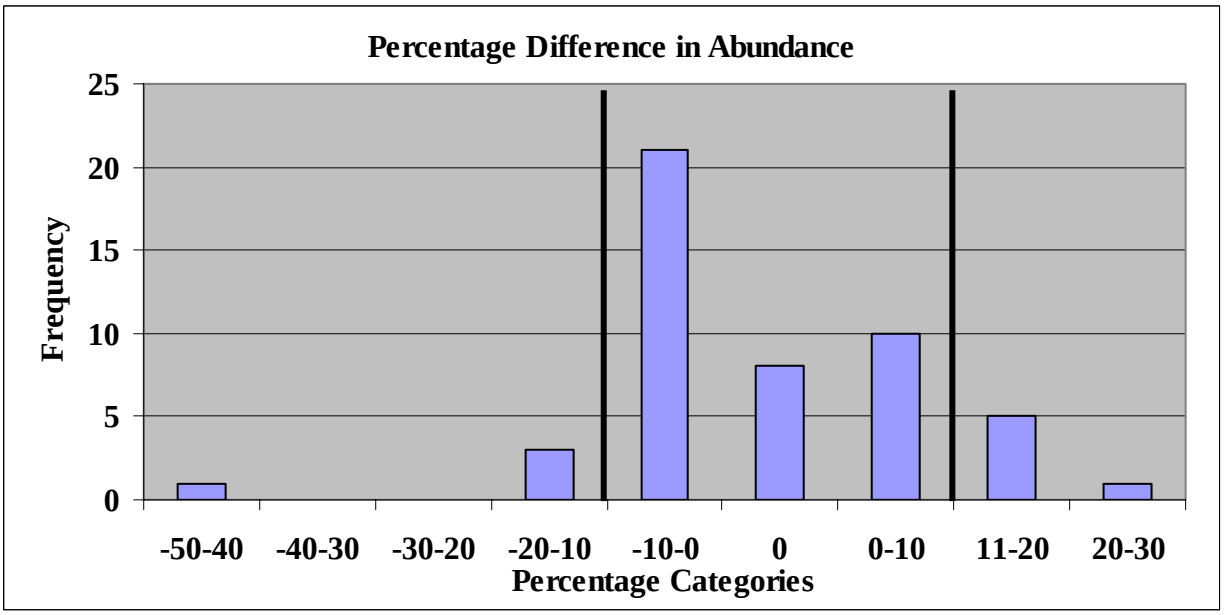

Figure 1. Frequency histogram of percentage difference between volunteer and expert counted abundance for 49 RiverWatch samples taken during summer 2005. Vertical lines indicate boundaries of 10% absolute difference.

Total Taxa Richness.-Volunteer total taxa richness averaged 10.0 taxa and ranged from 2 to 19. Expert total taxa richness averaged 9.7 taxa and ranged from 2 to 16. These data suggested a slight overestimate of the number of total taxa reported by volunteers. Both place samples in the Fair quality rank. The difference averaged 4.0% and ranged from -28.6 to +100%—one volunteer reported 100% more taxa than the expert (Fig. 2). The largest single category of percentage difference was zero, represented 21 samples (42.9%). A positive outcome is that volunteers with ≤10% absolute difference contributed 32 samples (65.3%). Unfortunately, another 16 volunteers (32.7%) had absolute differences between 20-40%.

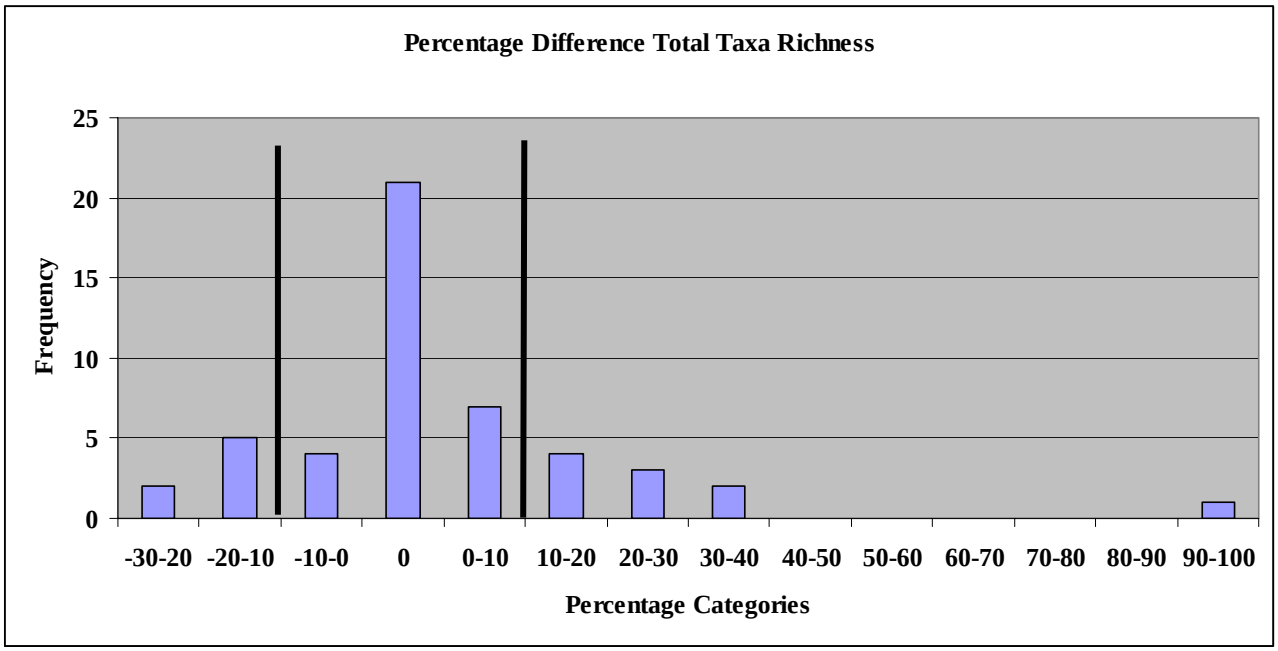

Figure 2. Frequency histogram of percentage difference between volunteer and expert counted total taxonomic richness for 49 RiverWatch samples taken during summer 2005. Vertical lines indicate boundaries of 10% absolute difference.

EPT Richness.-Volunteers tallied an average of 3.3 EPT taxa, which ranged from 0 to 9. Expert determined EPT averaged 3.2 and ranged from 0 to 9. These averages also place the samples in the fair quality ranking. EPT percentage difference averaged 6.05% (Fig. 3) and ranged from -66.7 to 100%. The largest single category for percentage difference was zero, with 36 responses (73.6%). The remainder, 27.4%, fell outside of the 10% absolute difference level.

Macroinvertebrate Biotic Index (MBI).-Volunteer calculated MBI averaged 5.49 units and ranged from 3.71 to 8.43. Expert calculated MBI averaged 5.55 units and ranged from 3.71 to 9.76. These values suggest that volunteers are providing slightly lower HBI values than are calculated by experts. They also place average streams in the fair quality ranking. The average percentage difference between volunteer and expert calculated MBI was -0.67%, which ranged from an underestimate of -41.21% to an overestimate of 20.15%. Since this metric is not an integer, it was difficult for volunteer and expert generated MBIs to match exactly, hence, 0% difference was one of

the least frequently represented classes (Fig. 4). The majority of responses (88.8%) were within the absolute 10% difference requirement.

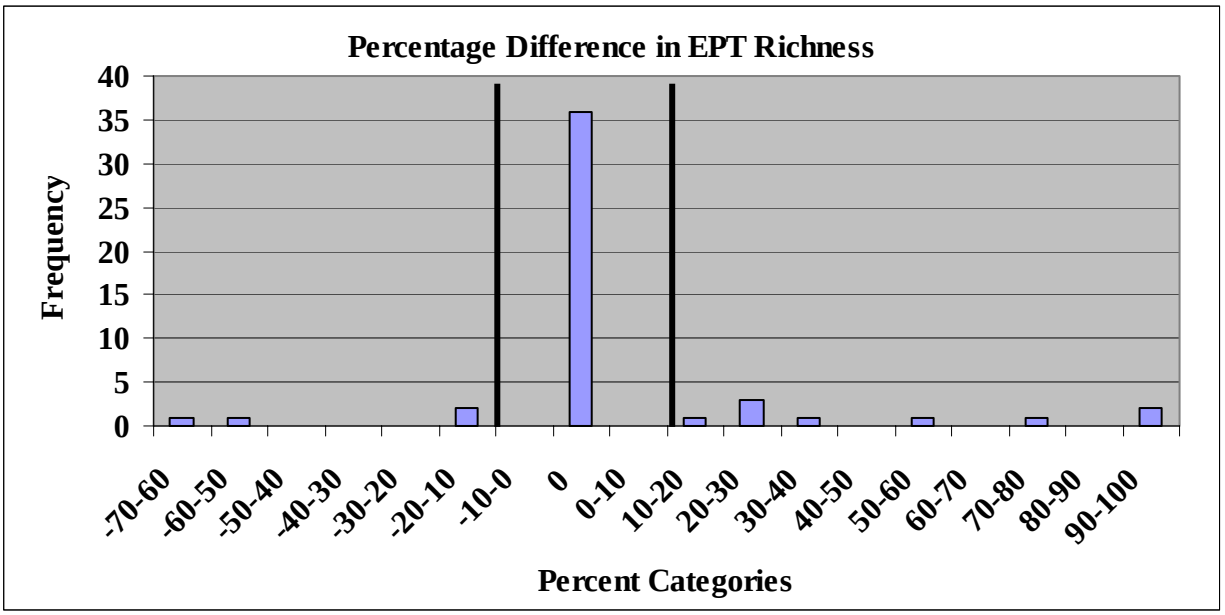

Figure 3. Frequency histogram of percentage difference between volunteer and expert counted EPT taxonomic richness for 49 RiverWatch samples taken during summer 2005. Vertical lines indicate boundaries of 10% absolute difference.

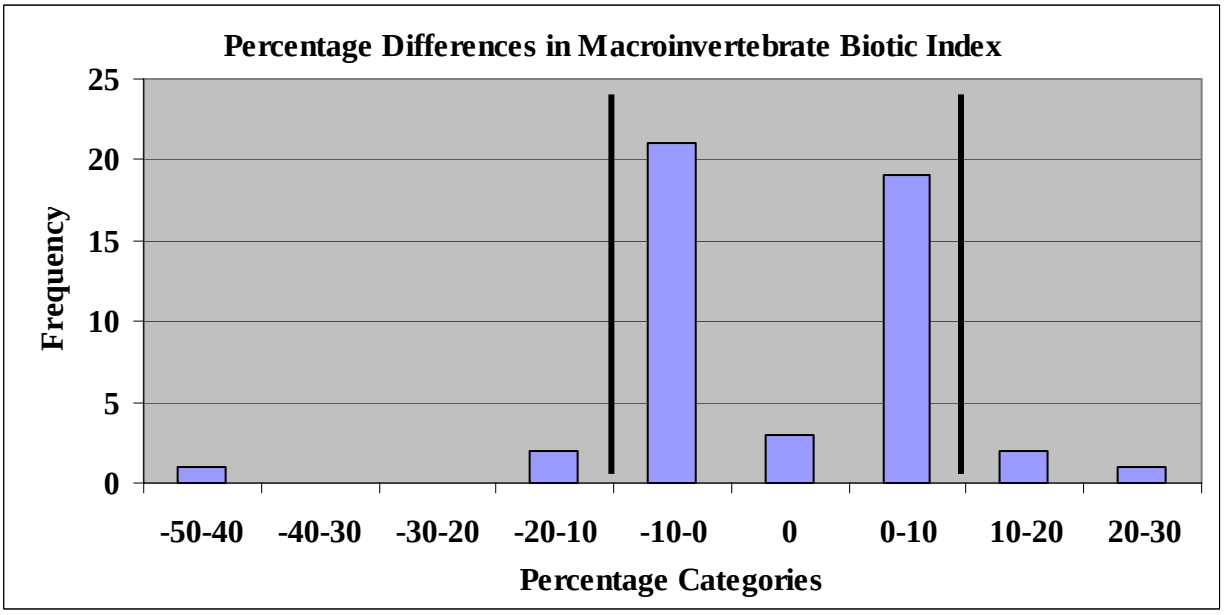

Figure 4. Frequency histogram of percentage difference between volunteer and expert counted macroinvertebrate biotic index for 49 RiverWatch samples taken during summer 2005. Vertical lines indicate boundaries of 10% absolute difference.

Discussion

The 2005 RiverWatch program has decreased dramatically in its effectiveness for gathering fully verifiable data. Only 99 volunteer submitted samples met standards for inclusion into the RW program. This constitutes less than 1/3 of the samples accepted during hayday of RW (Fig. 5). Most of the samples were from the counties outlying Chicago, with a preponderance of these being from the combined Fox and DesPlaines drainage. A few samples were from the St. Louis area, while a few others were from major downstate population centers. The only areas where RW might still be affective is in the greater Chicago area of the Fox and DesPlaines drainage.

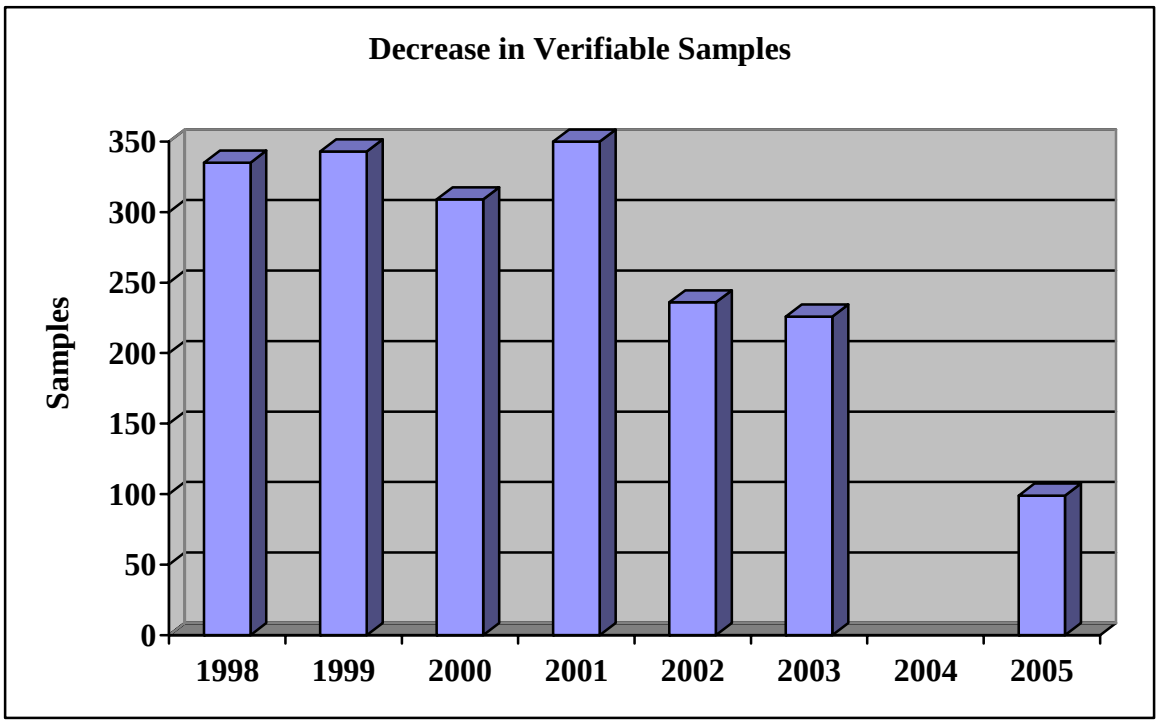

Figure 5. Number of complete and verified samples accepted by the RiverWatch program since 1998. Quality assurance of 2004 samples is underway and will be available in February 2005.

Three RW metrics were found to be robust enough (or insensitive enough) to have the vast majority of samples pass a 10% absolute difference test. These metrics included sample abundance, EPT richness, and the MBI. Total taxa richness scored somewhat more poorly than the other three.

It appears that several taxa still caused considerable problems for volunteers. Determination of the highly tolerant bloodworm midges from run-of-the-mill midges (fly larvae) is difficult to impossible without a good hand lens or microscope with 10X magnification. Hence, midges of lower tolerance value are often scored as the more highly tolerant group, or vice versa. Other problem taxa are broadwing vs. narrowwing damselflies, which have very different tolerances. These are not difficult to identify, requiring only a little practice. Others failed to properly identify topedo vs. swimming mayflies. Ocassionally, non-indicator taxa, mostly larvae of predaceous and water scavenger beetles, were confused with several target taxa. With the loss of regional trainers and offices, access to training and use of microscopes is limited.

The analysis provided here is not a complete one as compared to that RiverWatch personnel conducted in the past. It certainly hides some errors that volunteers make. For instance, a volunteer reports 10 total taxa and the expert reports the same, but if they are reporting a totally different

constitution, then this has some major effects upon the MBI calculation. Evaluating this source of error would likely be a very disappointing exercise.

Additionally, some volunteers seem to not be following instructions carefully or have intentionally decided to make changes in procedures. The most detrimental of these is that several volunteers elected not to send in their samples for possible quality assurance. Additionally, volunteers have left notes with their data sheets saying that some large taxa were returned to the waterbody because volunteers did not want to kill them. This is an admirable sentiment, but quality assurance personnel must assume that taxa marked on the data sheet but not found in the sample were misidentifications. Despite these shortcomings, average quality rankings across the data set were the same for volunteer and expert efforts.

On a personal note, I was pleased to have the opportunity to view specimens from RiverWatch. Given that volunteers can sample many more streams that I in a year, they provide specimens from streams for which the INHS has no data. Several species in these samples constituted important additions to our knowledge of the state. For instance, streams in the Midewin National Tallgrass Prairie and one location on the East Fork of Mazon River provided additional locations for a species of crawling mayfly (Ephemerellidae: *Dannella lita*)) that has become dramatically rarer over the 20th Century. These new locations are important documentation of their continued existence in the state.