Alexauken Watershed Visual Assessment

QUALITY ASSURANCE PROJECT PLAN

West Amwell Township
Delaware Riverkeeper Network
Princeton Hydro, LLC

February 20, 2006

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SECTION 2. PROBLEM DEFINITION/BACKGROUND

The Alexauken Creek, draining 15.12 square miles and including 28.64 stream miles and 52.31 lake acres, runs southwest from its headwaters in West Amwell, Delaware and East Amwell Townships, draining through the City of Lambertville and crossing under the Delaware & Raritan Canal into the Lower Delaware Wild and Scenic River Area. The creek drains nearly 10 percent of the largely forested Sourland Mountain region and flows through a region facing growing development pressures. In the fall of 2003, NJDEP formally proposed reclassification of the Alexauken to Category One (C1). Four organizations (Regional Planning Partnership, Sourland Planning Council, Delaware Riverkeeper Network, and Hunterdon Land Trust Alliance) had nominated the Alexauken for C1 reclassification based on its connection to the federally-protected Delaware River, its value as habitat for threatened and endangered (T&E) fish and bird species and the relatively undeveloped nature of its watershed. These groups and watershed municipalities, including West Amwell, submitted comments supporting the reclassification and celebrated the final adoption of the C1 designation in July 2004.

Although the Alexauken Creek Watershed is recognized as ecologically significant with the C1 designation, it has not been comprehensively characterized or monitored. For example, although the creek appears on Sublist 1 (attaining water quality standards for aquatic life) of NJ's 2004 Integrated Water Quality Monitoring and Assessment Report, little formal assessment of other water quality indicators has been conducted in the creek and its tributaries. The limited information available suggests that the Alexauken Creek is currently impacted by a variety of nonpoint pollution sources which contribute significant sediment loads. These impacts are clearly reflected in the state's 1992, 1997 and 2003 AMNET data for benthic macroinvertebrates at three sites in the watershed, which suggest a decline in the invertebrate community possibly related to land use changes. Delaware River Basin Commission data (2001) also indicate elevated enterococcus concentrations in the creek. In addition, many of the creek's headwater streams have never been mapped, excluding them from the protections that the successful C1 designation has now afforded the rest of the waterway.

This visual assessment will be part of a major partnership effort to develop the Alexauken Creek Watershed Protection Plan under a New Jersey 319(h) grant. West Amwell Twp. will work with Delaware Twp., East Amwell Twp. and the City of Lambertville, which also have land within the watershed, as well as its other partners and the public, to develop and implement the plan. The plan will recommend specific measures necessary to protect and maintain the water quality and ecological integrity of the streams within the watershed and, where possible, to improve water quality and nonpoint source pollutant loading to restore the ecological community to a more pristine status.

Data Users

The first phase of the Watershed Protection Plan is a stream visual assessment of the entire basin conducted by trained volunteer monitors and Delaware Riverkeeper Network (DRN) scientists. Using the tiered approach developed by New Jersey DEP's Volunteer Monitoring Program, the partners envision the visual assessment component of this project fits into a Tier C category entitled, "Community Assessment."

This visual assessment data will be used by the project partners (i.e., Princeton Hydro, West Amwell Township, NJDEP etc.) to identify areas for additional chemical and biological monitoring to occur as part of the development of the Plan and to identify and map specific areas of concern and pollution inputs both within and surrounding the stream. Visual assessment data will also be used to help characterize unique features of the stream and areas deserving of better protection. Another goal of the visual assessment is to map undocumented headwater tributaries in order to better protect these overlooked areas. Finally, by involving trained volunteer monitors, the partners will strengthen the local momentum and watershed stewardship behind the Watershed Protection Plan to facilitate its implementation and realize positive on-the-ground improvements and protections for the Alexauken. This step of building local involvement, capacity and support will be critical to the impact of the Plan when it is completed.

SECTION 4. PROJECT/TASK DESCRIPTION

Locations of Surveys & Timeline

For the visual assessment, local volunteer monitors will be recruited to be part of the project, which will include assessing the large majority of the 28.6 stream miles and immediately adjacent land area of the Alexauken Creek Watershed over a three-month period in early 2006 (February – April 2006). The visual assessment will also provide information as to where unmapped headwater tributaries exist and the partners will perform follow-up ground-truthing to map these tributary streams using hand-held and/or high-resolution GPS units. This assessment, which fits into the Tier C NJDEP monitoring category for community assessment, will be the first phase of a more comprehensive monitoring project that will have a separate QAPP submitted to NJ DEP after this visual assessment involving chemical and biological monitoring. The project partners will alert streamside landowners to the survey via direct contact, mail, newspapers, and township meetings in order to ensure that the public and streamside landowners are informed of the planned assessment activities, private property rights are not violated and the stream can be safely accessed by the scientists and volunteer monitors.

Evaluation of Results and Training

Volunteer monitors will be trained in the visual assessment protocol (VAP) during a seven-hour course involving both field and classroom instruction. At the conclusion of the training, volunteers will also complete an exam to evaluate how well each volunteer understands the concepts of the visual assessment. Based on the results of the exam, the project partners will provide additional guidance and training to any volunteers needing additional assistance after the course. Volunteers will be assigned specific stream reaches to monitor over a two-month period and required to dedicate at least eight hours of fieldwork to the project. Two volunteers will work together throughout the assessment for safety reasons, as well as to achieve consensus for filling out the assessment. Photo-documentation, reference maps (including GIS maps and aerial maps), and GPS units will be included among the assessment tools provided to volunteer teams to better document conditions and allow for verification in the office of specific conditions captured by volunteer monitors. The length of stream assigned to each volunteer team will be broken out into an approximate one-mile section per volunteer. As a result, the Alexauken Watershed has been broken out into 30 sections labeled from A-DD (see breakout map in Appendix A). Within that one-mile section, a reach will be defined by the trained volunteers and delineated based on major land use or stream changes. . Each reach will have an "Overall Reach Assessment Form" filled out for it by the volunteer. Volunteers will number the reaches consecutively and each reach start and end point will be pinpointed by the volunteer using the GPS unit. DRN monitoring staff and its partners have used this same approach successfully in the past. All results submitted by the volunteer monitors will be reviewed for accuracy and completeness and summarized. During the ground-truthing phase to map unmapped headwater streams, DRN scientists will verify a portion (10% of reaches verified with additional verification work as-needed based on results from the assessment) of the completed monitoring results that appear incomplete or incorrect based on the data review.

What will volunteers measure?

The volunteers will perform a visual assessment, modified to fit the purpose of the Alexauken Watershed Protection Plan Project. The visual assessment that will be used incorporates

appropriate criteria for the Alexauken Creek Watershed and was developed using components of the following standardized and accepted methodologies:

- USDA Stream Visual Assessment[1]
- Center for Watershed Protection's Unified Stream Assessment: A User's Manual[2]
- New Jersey DEP's Visual Assessment Protocol used by Watershed Ambassadors[3]
- NJ DEP AMNET Physical/Habitat protocol[4]
- DRN's Integrated Assessment[5]
- The Pfankuch channel stability evaluation[6]

The goals of integrating these various protocols is to reduce the amount of subjectivity and create a more volunteer-friendly stream assessment that provides useful information that volunteers are able to collect with minimal training.

This assessment, outlined on the "Overall Reach Assessment Form" will provide a numeric ranking of all reaches of the Alexauken Creek Watershed to gauge reach quality; identify specific pollution inputs and areas of high-quality intact systems; characterize stream channel conditions, habitat structure, and floodplain conditions; provide information on the extent and quality of riparian buffers; determine appropriate areas for further sampling; and map unknown headwater tributaries using GPS technology to better protect these unmapped reaches now afforded the rest of the waterway. Also, in January 2004, Princeton Hydro and West Amwell Township identified areas of significant erosion for the Watershed at several downstream segments of Alexauken Creek. Another goal of the project is to identify the sources and causes of this erosion.

Specifically, volunteers will measure the following components: reach accessibility and potential monitoring locations, invasive plant species and extent of colonization, land use within 50' and within ¼ mile of reach, drainage ditch and outfall pipe locations and characterization, and location and characterization of exceptional resources including vernal pools and headwater

[1] USDA NWCC Technical Note 99-1. Stream Visual Assessment Protocol, December 1998.
[2] Kitchell, Anne, and Tom Schueler, Center for Watershed Protection. Unified Stream Assessment: A User's Manual Version 1.0, March, 2004.
[3] NJ DEP, Division of Watershed Management. Visual Assessment.
[4] NJ DEP, Bureau of Freshwater and Biological Monitoring, Stream Habitat Assessment for AMNET Sites.
[5] Albert, Richard, Dan Salas, & Dave Williams, Delaware Riverkeeper Network. Integrated Stream Assessment, 2002.
[6] Pfankuch, Dale J. 1975. Stream Reach Inventory and Channel Stability Evaluation. USDA Forest Service,. R1-75-002. Govt. Printing Office, # 696-260/200.

unmapped streams. In addition, the volunteers will rank 11 criterion for each stream reach with a score ranging from 1-10 or 1-5. Categories include: vegetated buffer width, vegetated buffer condition, canopy cover, pool variability, floodplain encroachment, bank stability, channel condition, manure presence, available cover for aquatic life, barriers to fish movement, and velocity/depth variability (See Appendix B for datasheet and list of instructions).

Project timetable

Activity	Projected Start Date	Anticipated Date of Completion
Recruitment of volunteers	August 2005	February – March 2006
Development/NJ DEP approval of QAPP	November 2005	February 1, 2006
Develop and hold volunteer training course (2 trainings)	December 2005	February 25 and March 11, 2006
Implementation of assessment	February 2006	April 15, 2006
Targeted ground-truthing	February 2006	April 2006
Evaluation of assessment	February 2006	October 2006
Mapping of headwater tributaries	February 2006	October 2006

SECTION 5. MEASUREMENT QUALITY OBJECTIVES

A. Data Precision, Accuracy, Measurement Range

The Visual Assessment Protocol will primarily make qualitative assessments of the stream and riparian habitats. Such qualitative assessments do not have easily defined Measurement Quality Objectives. The primary quantitative data that will be collected are the geographic coordinates for unmapped headwater streams, exceptional resources and conditions, severe erosion areas, invasive plant infestations, outfalls and drainage ditches (legal and illegal), and other point and non-point source pollution areas. Photographs will also help verify information.

Matrix	Parameter	Measurement Range	Accuracy	Precision
n/a	Geographic Coordinates via WASS enabled GPS unit (using NJ State Plane NAD 83)	± 90º N and ± 90º E depending on satellite availability	Unbiased	< 49ft RMS; 10 ft with DGPS (WAAS) corrections
n/a	Qualitative Visual Assessment Scores	1-10 for most parameters; 1-5 for others	Unknown; no objective standard	Unknown; depends on volunteers, training, and setting

B. Data Representativeness

All mapped stream segments will be included as candidate areas for stream visual assessments. As a result, the data attain full representativeness, with no section of the watershed's streams originally excluded from the visual assessment surveys. However, it is clear that access will not be possible for every stream reach within the watershed, either because of physical limitations or because of private property limitations. The final data will thus include all mapped stream segments not precluded through access issues, and the large majority of stream miles will be surveyed using the Visual Assessment Protocol (VAP). It is impossible at this time to anticipate the location of access limitations, but such limitations should represent a small fraction of the watershed and should therefore not distort the central data collection activities of this visual assessment. The data should provide an unbiased, relatively complete picture of conditions of the Alexauken Creek watershed. The data will therefore be representative of conditions within all areas of the Alexauken Creek during the time of sampling.

The visual assessment is designed to be a snapshot of physical conditions at the time of the sampling event. DRN will perform field verification of specific areas where discrepancies or incomplete information is submitted and further information is needed. Based on DRN's extensive experience in conducting stream visual assessments, the physical information collected does not tend to change dramatically unless large storm events or pollution incidents occur.

C. Data Comparability

The use of GPS receivers to document specific locations of watershed features (both problems and attributes) will ensure that the resulting geospatial data are comparable both within the study and more broadly across the various levels of geospatial data for the region. NJ State Plane NAD 83 will be used as the coordinate system to standardize how the points are collected. Aspects of the Visual Assessment Protocol, like all such qualitative habitat-scoring methodologies, will involve a greater degree of subjectivity and a coarser level of comparability. Because human judgment will be used to assign conditions a numeric score, different observers will potentially score a similar feature somewhat differently. This variability is unavoidable in a rapid visual assessment protocol. A relatively high degree of comparability within the study will be attained, however, through an intensive all-day training session involving both conceptual overview and in-field practical exercises, as well as a final assessment of participants to standardize the volunteers perceptions of watershed features. Volunteers will also be instructed to add narrative information and take photographs to help clarify their scoring methods. In addition, the volunteers will conduct their assessments within a short time of the training session (6 week window), thus increasing the retention between training and practical application. Finally, DRN staff will review all volunteer data sheets and evaluate them for completeness and accuracy. Both gaps in the collected data as well as apparent anomalies will be addressed, further heightening the internal comparability of the study's visual assessment results.

D. Data Completeness

Ideally, volunteers will perform assessments for the entire Alexauken Creek Watershed covering the 28.6 stream miles as well as watershed areas adjacent to the stream monitoring reaches to help better define land use issues. Areas not covered by the volunteers, due to time constraints, or private property, will be assessed by DRN staff to the extent possible given staff and resource availability. Unmapped headwater areas will also be assessed and mapped for better detail of the Alexauken Creek watershed. The combined efforts of the volunteers and DRN staff will result in the large majority of stream reaches being assessed through these efforts. As noted above, there will clearly be areas that cannot be assessed because of access issues, but the data collected through the visual assessment will attain the highest level of completeness feasible given the current ability to access the watershed's streams. As part of the assessment, all streamside property owners have been notified by mail about the assessment from each of the three townships included in the Watershed. Routine press coverage in local papers has also helped acquaint area residents about the monitoring project.

SECTION 6. TRAINING REQUIREMENTS AND CERTIFICATION

A. Training Logistical Arrangements

Type of Volunteer Training	Who Will Conduct Training	Frequency of Training/Certification
7-hour instruction including classroom and field instruction	Delaware Riverkeeper Network, NJDEP Volunteer Monitoring Coordinator	Training with a post-test to determine volunteers that may need additional assistance.
Follow-up instruction	Delaware Riverkeeper Network	As-needed basis, dependent on test scores

B. Description of Training and Trainer Qualifications

Volunteers will be required to attend a seven-hour instructional course before performing monitoring. Trainers will consist of professional DRN scientists with degrees in stream science who have knowledge and experience in conducting visual assessments. The New Jersey DEP Volunteer Monitoring Coordinator will also be part of the training course. The classroom component of the assessment will focus on the following topics: purpose and overview of the assessment; goals and importance of the Alexauken Protection Plan; volunteer requirements, expectations and timeline; specifics on parameters to be monitored using photos and a discussion of each parameter to be monitored (based on NJDEP Americorps training for VAPs); training on the use of hand-held GPS units; review of the datasheet and maps provided; and a post-test to determine volunteers needing additional assistance. The training will also provide for a trial assessment in the field with a follow-up discussion on volunteer results.

C. Description of how you will evaluate volunteer performance

A post-training test after the seven hour instruction period will be completed by the volunteers to ensure that all volunteers have acquired the skills and knowledge needed to successfully complete the visual assessment. The post-training test will be reviewed by DRN trainers to identify volunteers in need of more instruction before performing the assessment. Those volunteers needing more assistance will be provided it by the trainers. In addition, completed datasheets will be reviewed by DRN to identify potential anomalies and ground-truthing will be conducted when needed. Volunteers will have about a 30-day period to complete their assessments and the project partners will track and follow up with any volunteers not submitting completed datasheets for their assigned stream segment within the designated time period. In addition, DRN staff will meet up with volunteers on designated days to oversee their work and answer any questions both before and after the day of field work.

SECTION 7. DOCUMENTATION AND RECORDS

Since the visual assessment component of this project will be performed over about a 3-month period of time, all project partners will be provided with an approved QAPP via e-mail and through the regular project partner meetings. After final approval of the QAPP, it is envisioned there will be no follow-up amendment to the visual assessment QAPP since the monitoring will take place only once with limited follow-up for site verification. Instead, the project partners will use the data collected as part of this QAPP to develop a QAPP for the more extensive biological and chemical monitoring that will be part of the second phase of the Alexauken Creek Watershed Protection Plan (equivalent to a Tier D volunteer program).

Each volunteer monitor must complete the VAP on-site at the time that the assessment occurs using the standardized datasheets provided by DRN. Volunteers will record reach ID number, GPS locations for the start and end points of the reach (using Garmin eTrex GPS unit), the length of time that elapsed during the assessment and the name and contact information of each volunteer monitor. Photographs (a minimum of four photos per reach) will also be taken along the reach to help verify observations. All field datasheets and photos will be sent to DRN and kept on file for a minimum of five years, per USEPA's "Guidance for Quality Assurance Project Plans" (December 2002), and USEPA's "Requirements for Quality Assurance Project Plans" (March 2001). A second copy of datasheets will be distributed immediately to Princeton Hydro for use in monitoring location selection and filed at Princeton Hydro until project completion. At project completion, copies of datasheets will be provided to West Amwell Township, Delaware Township, Lambertville, and East Amwell Townships. Datasheets will also be reviewed and summarized in an electronic format in order to use the data effectively. Ten percent of input data will be proofed to ensure electronic data validity. Electronic data will be backed up on CDs and shared with all project partners and made available to interested members of the public. CDs will also be kept on file by both DRN, NJDEP and Princeton Hydro, LLC for a minimum of five years.

As appropriate, GPS data collected through the visual assessment will also be downloaded onto base maps to map undocumented tributaries or other important areas characterized during the assessment. The GPS portion of this data will be summarized by Princeton Hydro's GIS professionals. Metadata will be created for any GIS layer made.

SECTION 8. SAMPLING/ASSESSMENT PROCESS DESIGN

A. Rationale for Selection of Assessment Sites

Stream surveys will be conducted from February thru April 2006 on the majority of the 28.6 stream miles that make up the Alexauken watershed. Volunteers will be instructed to perform assessments during a five-week period. It is envisioned that volunteers may take several field days to complete their designated stream segment. If a volunteer is unable to perform the entire assessment, s/he is to contact Faith Zerbe, the VAP coordinator, so other assignments can be made.

For each reach surveyed, a visual assessment form will be completed. Reaches will be identified using GPS, a description on the datasheet, photographs and maps. Volunteers will be instructed to work in pairs for safety reasons and verify locations using topographic, road maps and aerial photographs.

Because the assessment will be performed after leaf-drop, inclement weather could be an obstacle to performing the assessment within the approved timeframe. It is envisioned that walking all reaches of the stream will also be difficult in some areas that are less accessible due to topographic, safety or private property issues. Inaccessible areas will be noted on the datasheets and the VAP coordinator will determine if follow up monitoring of these areas if necessary based on the summary and analysis of completed assessments.

B. Sample Design Logistics

Review Volunteer Tip Sheets and Datasheets (Appendix B) to see the itemization of parameters to be monitored as part of the visual assessment. The study will be conducted over a three-month period from February through April 2006. Volunteers will perform assessments of stream reaches during this time and verification of the data will be completed by DRN. Each stream reach identified by the volunteer monitor will have a completed visual assessment form and scoring assigned to it, including a list of specific features and their geographic coordinates. Targeted ground-truthing will take place if datasheets submitted are incomplete or appear to be inaccurate. Sampling frequency will be one site visit with follow-up verification if deemed necessary by the review of data by DRN and Princeton Hydro scientists.

SECTION 9. SAMPLING METHOD REQUIREMENTS

Not applicable to this visual assessment study design. A visual assessment will be conducted by trained volunteers. Photographs and GPS readings will be taken to document and verify observations.

SECTION 10. SAMPLE HANDLING AND CUSTODY PROCEDURES

Not applicable to this visual assessment. No samples will be taken for this phase of the Alexauken Project. All completed datasheets and photographs will be submitted to DRN and Princeton Hydro for analysis and reporting. A hard copy of datasheets will also be provided to West Amwell, Delaware, East Amwell Townships and Lambertville at the conclusion of the Project.

SECTION 11. ANALYTICAL METHODS REQUIREMENTS

The visual assessment to be performed by volunteers and DRN staff is a derivation of the following standard visual assessment protocols:

- USDA Stream Visual Assessment[7]
- Center for Watershed Protection's Unified Stream Assessment: A User's Manual[8]
- New Jersey DEP's Visual Assessment Protocol used by Watershed Ambassadors[9]
- NJ DEP AMNET Physical/Habitat protocol[10]
- DRN's Integrated Assessment[11]
- The Pfankuch channel stability evaluation[12]

See Appendix B for more information on the procedures and tip sheets supplied to volunteers.

Hand-held Garmin GPS equipment and disposable cameras will be the only equipment provided to the volunteer monitors. Monitors will identify the specific model and number of the GPS handheld unit they use on their datasheets and will also be trained in the proper use of the GPS unit.

[7] USDA NWCC Technical Note 99-1. Stream Visual Assessment Protocol, Decmber, 1998.
[8] Kitchell, Anne, and Tom Schueler, Center for Watershed Protection. Unified Stream Assessment: A User's Manual Version 1.0, March, 2004.
[9] NJ DEP, Division of Watershed Management. Visual Assessment.
[10] NJ DEP, Bureau of Freshwater and Biological Monitoring, Stream Habitat Assessment for AMNET Sites.
[11] Albert, Richard, Dan Salas, & Dave Williams, Delaware Riverkeeper Network. Integrated Stream Assessment, 2002.
[12] Pfankuch, Dale J. 1975. Stream Reach Inventory and Channel Stability Evaluation. USDA Forest Service,. R1-75-002. Govt. Printing Office, # 696-260/200
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SECTION 12. QUALITY CONTROL REQUIREMENTS

A. Field QC Checks

DRN professional staff will review completed datasheets and photographs. DRN will verify 10% of the data collected by volunteers and perform additional spot checks for any incomplete and/or anomalous data.

B. Laboratory QC Checks

Not applicable as no monitoring equipment will be used.

C. Data Analysis QC Checks

All data entry will involve detailed QC checks of the digital data prior to analysis. Entered data will be proofed in their entirety for accuracy, and all errors found during the QC checks will be corrected in the final digital data files.

SECTION 13. INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

Volunteer monitors will be instructed on how to properly use the GPS units and be provided with a User's Manual and a GPS Tipsheet to carry with them in the field. GPS Units will be equipped with extra lithium batteries to ensure proper function in the field. A volunteer will also be noting locations and features with a map and field notes for redundancy in the event that the GPS units fail or malfunction but this is not anticipated to be a significant risk.

GPS coordinates will be examined for completeness by DRN and Princeton Hydro staff. Following data entry, significant features will be mapped using GIS software to identify and validate the coordinates given for each feature.

SECTION 14. INSTRUMENT CALIBRATION AND FREQUENCY

GPS units are Garmin eTrex and are WAAS enabled with built-in calibration abilities. State Plane NAD 83 datum will be the standard recorded by volunteers.

SECTION 15. INSPECTION/ACCEPTANCE REQUIREMENTS

Not applicable for majority of visual assessment, as the only supplies will include datasheets, clipboard, and disposable camera. Princeton Hydro will correct obvious GPS position inaccuracies after GIS layers are added to the maps.

SECTION 16. DATA ACQUISITION REQUIREMENTS

GIS base maps for the volunteer monitors will be produced by Princeton Hydro, LLC. These maps will be generated from local tax maps, USGS 7.5 minute topographic maps and aerial photographs available from the NJ Office of Information Technology, Office of GIS. NJPDES data on approved discharges may also be incorporated to assist the volunteers in identifying illegal discharges. Other layers included are roads and public access points. Road maps will also be provided to the volunteers to assist with identifying public access points.

SECTION 17. DATA MANAGEMENT

Data collected by volunteer monitors will be checked for accuracy and discrepancies by the project partners when volunteers submit their completed data sheets, equipment and photographs. As part of the wrap up of the study, DRN will meet up with volunteers of the study to review any major problems or issues and to receive a report-out for volunteers. It is envisioned that not all volunteers will attend this wrap up session but instead send in or drop off their data. Any incomplete information or information that appears to be inadequate or incorrect will be ground-truthed by DRN staff to correct any problem data.

Once all data are examined and completed, data will be entered into electronic data files. Once entered into electronic format, all data will be proofed in their entirety for accuracy, with any transcription errors corrected in the final electronic data sets. Princeton Hydro will download and enter GPS data on base maps. A summary report of the data with maps identifying recommended sampling locations will be provided to the project partners to consider as part of the planning phases for Phase 2 of the project. Microsoft Excel, Word, and Arcview by ESRI will be used to help summarize the data collected by volunteer monitors, along with any specialized software programs, as needed. Metadata will be created with any coverage created from the project.

SECTION 18. ASSESSMENT AND RESPONSE ACTIONS

Review of volunteer monitors is the responsibility of the VAP coordinator, in conjunction with the Project Manager. Follow up with volunteers will be provided at the conclusion of the study, but since this is a targeted assessment, no long-term guidance is applicable beyond the assessment period. Volunteer information for each stream segment will be included on the datasheets so follow up via phone will be possible if questions arise upon review of the datasheets. In addition, data entry will be evaluated in its entirety, and corrections will be made to any errors in data entry.

SECTION 19. REPORTS

Quarterly reports will be provided to NJDEP and the project partners that summarize work conducted under the Alexauken Creek Watershed Project as part of the 319(h) project. A report that summarizes the major conclusions of the visual assessment will be provided for project partners to use in implementation of the chemical and biological monitoring component of the project and development of the biological and chemical monitoring QAPP , as well as to assist with the development of the Watershed Protection Plan. It is envisioned that two reports will be generated: an abbreviated version focusing on monitoring locations and accessibility will be produced immediately upon completion of the visual assessment, while a longer, more detailed report summarizing other information will be produced in the following months. Components of the findings will also be made available through a Powerpoint presentation that will help draw in local support for the plan and its implementation. The Protection Plan will also highlight many of the findings developed from the visual assessment. Revised base maps will also be completed based on additional data gathered during the visual assessment. If regulated pollution incidents are observed by volunteers during their surveys, they will be instructed to report the pollution incident to the NJDEP hotline (1-800-WARN DEP) and any other appropriate agencies and alert DRN of the problem for follow-up. DRN will notify the watershed area manager, Ms. T. Romagna, of the incident.

SECTION 20. DATA REVIEW, VALIDATION AND VERIFICATION

Data that are incomplete or anomalous will be evaluated for their utility. Where possible, incomplete data will be supplemented with follow-up assessments by DRN staff, and the subsequent data will be incorporated into project databases and reports. Anomalous data will be scrutinized carefully to determine whether any portion of the data are valid, and whether questionable data can be rectified with follow-up field assessments by DRN staff. Anomalous data which cannot be corrected or completed will be entered but will be flagged as preliminary and unverified data. Similarly, incomplete data will be flagged in the data sets as partial data records.

SECTION 21. VALIDATION AND VERIFICATION METHODS

Submitted dataforms will be reviewed by the VAP Coordinator for accuracy and completeness, and checked with submitted photographs. This initial screening to ensure that all data have been collected, and that the collected data are in the proper format serves as the "validation" step. Ten percent (10%) of the Visual Assessments will be field-verified by DRN staff to assess the accuracy of the collected data. This Quality Control check will serve as the "verification" step of the data collection process.

All collected data will be entered into electronic files, and the entered data will be proofed in their entirety against the original data sheets. The proofing will evaluate whether all data have been entered, whether the right format for the data have been included, and whether the correct numeric values for these data have been entered. As such, the proofing of 100% of the data entry will serve as both the "validation" and "verification" steps. Errors in data entry will be documented, and the final electronic files will be corrected of all errors.

Electronic reports will be circulated in draft form for review by the project partners and limitations of the study will be included in the reports. These limitations will assist with VAP monitoring efforts that are not part of this project but that may enhance the quality of data for similar monitoring assessments in the future. It is also important to note that iterations of this protocol have already been field tested in the past and improved over time based on analysis of past results from other assessments conducted by the project partners.

SECTION 22. RECONCILIATION WITH DATA QUALITY OBJECTIVES (DQOs)

As soon as possible after survey completion, review of the datasheets will be conducted by the VAP Coordinator. If incomplete or inaccurate data appear to be submitted, resurveying those reaches by DRN staff may occur based on the extent of data needed and completed reaches. Any limitations on data use will be detailed in the final visual assessment reports.

Appendix A.
Watershed Maps

Appendix B.
Volunteer Field Packets

Stream Toolkit for the Alexauken Visual Assessment

Delaware Riverkeeper Network
P.O. Box 326
Washington Crossing, PA 18977
215-369-1188

This project funded by a grant from the New Jersey Department of Environmental Protection, 319h Nonpoint Source Pollution Reduction Program

Instructions for Completing
Visual Assessment Data Sheets For Alexauken Creek

Introduction to the VAP

Volunteer monitors will perform a visual assessment, modified to fit the purpose of the Alexauken Watershed Protection Plan Project. The visual assessment that will be used incorporates appropriate criteria for the Alexauken Creek Watershed and was developed using components of the following standardized and accepted methodologies:

- USDA Stream Visual Assessment[1]
- Center for Watershed Protection's Unified Stream Assessment: A User's Manual[2]
- New Jersey DEP's Visual Assessment Protocol used by Watershed Ambassadors[3]
- NJ DEP AMNET Physical/Habitat protocol[4]
- DRN's Integrated Assessment[5]
- The Pfankuch channel stability evaluation[6]

The goals of integrating these various protocols is to reduce the amount of subjectivity and create a more volunteer-friendly stream assessment that provides useful information that volunteers are able to collect with minimal training.

This assessment, outlined on the "Overall Reach Assessment Form" will provide a numeric ranking of all reaches of the Alexauken Creek Watershed to gauge reach quality; identify specific pollution inputs and areas of high-quality intact systems; characterize stream channel conditions, habitat structure, and floodplain conditions; provide information on the extent and quality of riparian buffers; determine appropriate areas for further sampling; and map unknown headwater tributaries using GPS technology to better protect these unmapped streams. Also, in January 2004, Princeton Hydro and West Amwell Township identified areas of significant erosion for the Watershed at several downstream segments of Alexauken Creek. Another goal of the project is to identify the sources and causes of this erosion.

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[1] USDA NWCC Technical Note 99-1. Stream Visual Assessment Protocol, December 1998.
[2] Kitchell, Anne, and Tom Schueler, Center for Watershed Protection. Unified Stream Assessment: A User's Manual Version 1.0, March, 2004.
[3] NJ DEP, Division of Watershed Management. Visual Assessment.
[4] NJ DEP, Bureau of Freshwater and Biological Monitoring, Stream Habitat Assessment for AMNET Sites.
[5] Albert, Richard, Dan Salas, & Dave Williams, Delaware Riverkeeper Network. Integrated Stream Assessment, 2002.
[6] Pfankuch, Dale J. 1975. Stream Reach Inventory and Channel Stability Evaluation. USDA Forest Service,. R1-75-002. Govt. Printing Office, # 696-260/200.

Step-By Step Guidance for Volunteer Monitor Teams

Safety First

Be sure to monitor with a partner and be safe. Streams are slippery places and walking a streambank can put you face-to-face with rose bushes and other hazards. Wear protective clothing (long sleeves and durable pants—waders can be very helpful) and comfortable waterproof boots if you have them. Be aware of deer ticks (which are the size of a pepper flake)..it's been a mild winter. Don't forget hats, gloves, and scarves and wear multiple layers with a wicking layer near your skin to keep from getting chilled. If you dress appropriately, your time along the Alexauken will be one you remember fondly!

Respect Private Property

Respect private property and invite streamside landowners to participate in the assessment. You are a local citizen of the Alexauken so you likely already know a lot of the neighbors along the stream you are surveying. Remember, you have copies of the landowner letters that were sent to streamside landowners, volunteer badges, and newspaper articles about the assessment so use these if you need to educate landowners you meet along your travels.

Visual Assessment Datasheets
Overall Reach Assessment Form

You have several datasheets to help you on your journey along the Alexauken. The first is the "Overall Reach Assessment" which should be filled out multiple times along your entire stream segment based on how many reaches you define along your walk. This form consists of five pages designed to help you characterize each reach thoroughly. Each volunteer team has received a stream segment which is about one mile in length and is labeled on the set of maps you have received. You and your teammate will be determining when there has been a change in land use or stream conditions to warrant you defining another reach and filling out another "Overall Reach Assessment". In complex, changing places of the Alexauken, you may have many reaches where if things remain constant and landuse or the stream does not change, you may end up with only a few reaches within your one-mile segment.

Drainage Ditch & Stormwater Outfall Survey

In addition to the "Overall Reach Assessment" you also have a "Drainage Ditch & Stormwater Outfall Survey" and an "Invasive Plant Survey" that you can use to supplement information you are collecting on your "Overall Reach Assessment Form". We envision that the "Drainage Ditch Survey" will be used more often by you as ditches and drainage problems will likely be more evident to you than invasive plants. **Don't forget to document drainage ditches along roadways that lead to the stream.** You should fill out a Drainage Ditch survey for every pipe and/or drainage ditch you find along your stream segment. The pipe/ditch should also be marked on your reference map. The data collected here is critical in determining point sources and nonpoint sources of pollution entering into the stream and in many cases, your eyes may be the only sets to detect such problems for the Alexauken. **Please note that this assessment form is split up into two parts so you could potentially record a ditch and a pipe on one form. Don't get too hung up on differentiating the two potential inputs of pollution. In some cases, for example, you may see a ditch from a road that leads to a pipe where it meets the stream. In this case, just pick one of the sections and fill out for the one input. Don't get**

confused with culverts that are located under roadways and allow the stream to pass under the road. You do not need to fill out information for road culverts on this form.

Invasive Plant Survey

Identifying invasive plants, even if you are a plant person, can be very difficult, particularly in the winter months when foliage is limited. For those of you who know your invasive plants, please use the form as there are many plants in the Alexauken that are threatening our native species. For those whose green thumb is limited, do not stress out and feel obligated to fill out this form. We have enclosed a copy of, "*Plant Invaders of Mid-Atlantic Natural Areas*," published by the National Park Service and the U.S. Fish & Wildlife Service to familiarize you with invasive plants.

If you see a lot of one type of plant, it could be that you are seeing an invasive species. For example, in headwater areas of the Alexauken (and many other headwater streams), multi-flora rose is often present along small tributaries in very large, dense stands. As a general rule of thumb, most of the vines you may see growing up trees and shrubs are invasive plants such as japanese honeysuckle, asiatic bittersweet, or mile-a-minute. The one native vine you may see in the woods is grape which has a characteristic shaggy bark. **Again, don't panic and remember you can always take a picture of a suspect plant and we can likely identify it.**

Your Photo Log

Another extremely important sheet you have at your service is the Photo Inventory Sheet which you should use throughout your assessment. **Please, be sure to fill out the sheet as you take photos and mark down descriptions as you go along**. It is always tempting to take a roll of film and document later but you will save yourself a lot of head-scratching and time if you document as you perform the field work. **Photos that arrive to us with no documentation or log are unusable so please fill out the log.** We suggest having one member in charge of the camera and photo inventory sheet so you utilize the camera as much as possible. As the old saying goes, "a picture (with good reference points & scale) is worth a thousand words". We recommend having two clipboards, one for your assessment and one for your photo log. You will use a running photo log to document photos for your entire segment rather than filling out a photo log specifically for each reach. We recommend taking at least 4 photos per reach at least.

Your Maps & Stream Sketches

The GIS maps provided to you are a treat for most who have the luxury of having them for assessment work. We have spent many times sketching from scratch which is something you don't have to do this time around. You can use the white 11X17 map (with no aerial coverage) to help document your photo locations, areas of impacts, wetlands and vernal pool habitat, etc along your segment. **You should also use this map to help document headwater areas where it appears that not all of the stream is present on the map.** The light blue lines on the map consist of information about streams noted by the Soil Conservation Service or the Stony Brook Millstone Watershed Association. It is important that you note if these lighter blue tributaries are present and documented completely. Your on the ground thoroughness and documentation of streams that are not on the map will help protect the Alexauken headwaters in the future so please, when you see a small tributary or rivulet of water that is not present as a branch on the map, draw it in and note it on the datasheet. We will be revisiting these areas in the future to

help secure that these small but important streams are recognized as part of the Alexauken Watershed. You also have the 11X17 map with the aerial photograph which will help you find your bearings as well as help determine land use within a quarter mile of the site. The yellow line on the maps represents a 500-foot perimeter around the stream. Finally, you have an overall GIS map that identifies your segment within the entire watershed and a road map to help you get to your destination. Along these same lines, remember that you have a compass built into the GPS unit if you need it.

Be sure to utilize the large blank 11X17 map to document things you are seeing along your stream segment (such as road crossings, drainage ditches and outfalls, flocks of waterfowl, invasive infestations, location of significant erosion, etc).

Your GPS Unit

Wow, another great tool not always available for stream monitors. The Etrex Camo is a small but mighty tool to use in the field. Treat it with good care and use it when documenting the majority of information on the assessment forms. You won't need to save waypoints but rather write down your information directly on the datasheets as you go along. Leave the unit on as you go—you should have plenty of battery juice. Refer to the GPS tipsheet or manual for use. **Don't forget to make sure the GPS Unit is in WAAS mode to ensure the best accuracy possible for your observations and record your readings in latitude and longitude**.

Latitude & Longitude

Any location on earth is described by two numbers--its **latitude** and its **longitude**. If a pilot or a ship's captain wants to specify position on a map, these are the "coordinates" they would use.

Actually, these are two angles, measured in degrees, "minutes of arc" and "seconds of arc." These are denoted by the symbols (°, ', ") e.g. 35° 43' 9" means an angle of 35 degrees, 43 minutes and 9 seconds (do not confuse this with the notation (', ") for feet and inches!).

When looking at a map, latitude lines run horizontally. Degrees latitude are numbered from 0° to 90° north and south. Zero degrees is the equator, the imaginary line which divides our planet into the northern and southern hemispheres. 90° north is the North Pole and 90° south is the South Pole.

The longitude lines converge at the poles, are widest at the equator and run vertically. Degrees longitude are numbered 0° to 180° east and west. Unlike latitude, which has the equator as a natural starting position, there is no natural starting position for longitude. The adopted universal zero point of longitude is the Greenwich meridian in London.

For all datasheets you use, please fill them out completely so we can understand and track your pattern later and use your data as effectively as possible! Also, your comments are very important so please use the space we provide or additional sheets if you want to elaborate beyond the boxes and datasheet.

What to Take with You in the Field (*include definite items you should take)

Field Check List

Your partner*
Camera*
Extra film/memory sticks*
Thermos for drinks & snacks
GPS Unit, manual and tipsheet*
Extra batteries*
Datasheets & Tipsheets*
Volunteer badge, articles on assessment and landowner letters*
2 Clipboards*
Pencils & erasers*
Pruners
Waders, hip boots or waterproof shoes & extra pair of warm socks*
Compass (you have one in the GPS unit)
Binoculars (optional but good if you have areas you cannot access)
Plant Invaders Guide*
Tape measure or your pacing worksheet
Cell phone – call Faith at 610-291-1403 if you run into questions in the field

Overall Reach Assessment Form

The following is a line-by-line explanation of how to fill out the "Overall Reach Assessment" and the ways to obtain necessary information for your data sheets.

Date - Date on which the assessment was performed.

Segment ID #:

The stream segment ID is represented on the GIS maps that were provided to you and includes the approximate one-mile segment of stream you were assigned to assess. Please be sure to fill this information in on each page of the datasheets just in case they get separated. We recommend you begin your segment either at its headwaters and work downstream or at the southern most point and work upstream to avoid skipping around or missing areas of the stream.

Stream Reach ID:

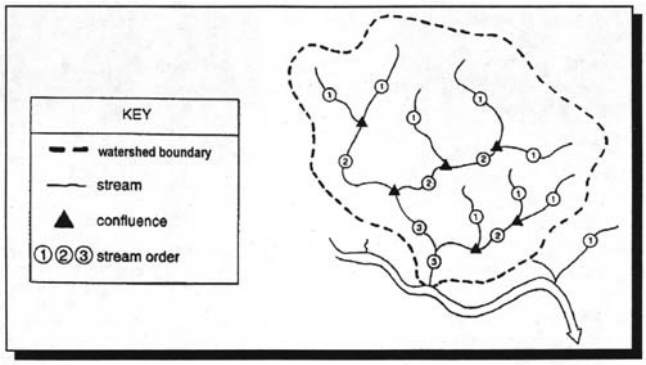
Reach ID's will be assigned by you as you determine different reaches along your segment based on changes in landuse or changes in the stream that warrant a new reach being assigned. Each reach you define should have an "Overall Reach Assessment" filled out for it along with other datasheets you may need to use for invasive plants and ditches. We recommend you define the reach as 1,2,3,4 and so on.

Start & End Time – Use military time to document your start time and end time on each reach assessment you complete

GPS Start & End Point – Use the GPS to document your beginning and end point for each reach. You should always walk the reach in its entirety before performing the scoring component of the assessment (pp 4&5) but along the way you can fill in information on monitoring access points, landuse, drainage ditches, etc. you see. **Use Latitude and Longitude to document all GPS points and be sure to have your Unit in WAAS Mode (see GPS tipsheet or manual for more info).**

Description: A brief description of the stream reach location (ex. reach began just south of Rte 13 along Wildlife Management Area property). Taking a photo of the reach facing downstream from a bridge or in the stream itself can be very helpful for data crunchers back at the office.

Stream Reach Order: Streams are classified by size. Determine, using the GIS map, what order of the stream is being assessed. Remember 1 is defined as a very headwater stream and as it joins other confluences, the order increases at each confluence. Two first order streams meeting make a second order and two second order streams meeting make a third order and so on. Note that that when a first order stream joins a second order stream, the resulting stream remains a second order stream. A third order stream is only formed if two second order streams come together.



(Source: Schueler, 1995b)

Reach Accessibility:

One of our goals of the assessment is to locate areas where further sampling can take place (both biological and water chemistry monitoring). Document the locations along a reach that you think would provide good access and that may also help pinpoint either high quality or a pollution problem. Provide latitude and longitude for these potential monitoring locations and reasoning for choosing location. Also take photos of these locations and document on photo log.

Severe Bank Erosion

The assessment is also trying to find areas where sediment pollution from erosion and impacts on the land may be impacting bank stability. Severe bank erosion is often dependent on stream order and energy from stormwater runoff but in general, any area where there are almost vertical eroded banks, sloughing, fallen trees, or overhanging banks should be considered severe, particularly if these areas are over 10 feet in length. Take a GPS reading and photos for these erosional areas and estimate the length of the erosion.

Mapping Exceptional Resources

One of the most critical pieces of the assessment is to map unique and sensitive habitats of the watershed that otherwise may go undocumented. **We are asking for this information along the 50' stream corridor but also consider, other places you know of as a watershed resident beyond this area that should be documented as part of the assessment. For example, if you know of a vernal pool in one of your favorite hiking grounds within the watershed that you hear spring peepers every spring, please capture this information for us and provide it when you hand in your data. Some of this info can be captured on the overall map of the watershed or a separate sheet of paper or datasheet.**

Vernal Pools

Vernal pools are confined wetland depressions, either natural or man-made, that hold water for at least two consecutive months out of the year and are devoid of breeding fish populations. Here in New Jersey, rural portions of the Skylands, Piedmont, and Coastal Plain landscapes are home to the majority of our vernal pools. These unique ecosystems provide habitat to many species of amphibians, insects, reptiles, plants, and other wildlife.

Vernal pools come in an array of forms: isolated depressions within upland forests, seasonally flooded meadows, floodplain swamps, abandoned gravel pits or quarries, and even derelict swimming pools. However, no matter what the structure or genesis of the pool is, all vernal pools either dry out completely or draw down to very shallow levels unsuitable for sustaining fish. Fish are highly predatory on amphibian eggs and larvae.

Amphibians that are dependent upon vernal pools are known as "obligate vernal pool breeders." In New Jersey there are seven species - two frogs and five salamanders - that fit this category. Another 14 of New Jersey's amphibians also use vernal pools for breeding, but unlike the 'obligate' species, these species can successfully reproduce in habitats that contain fish. These species are known as "facultative vernal pool breeders."

What to Look For to ID a Vernal Pool

- A confined basin/depression lacking a permanent outlet.
- Harbors documented obligate or facultative vernal habitat species (as identified in N.J.A.C. 7:7A, Appendix 1). **(amphibians may not be out as early as this assessment so don't disqualify an isolated confined basin if you see one)**
- Maintains water for at least two continuous months between March & September of a normal rainfall year.
- The area is free of fish populations, or dries up at some time during a normal rainfall year.

Unmapped headwater streams

You should also use the 11X17 map to help document headwater areas where it appears that not all of the stream is present on the map. Your on the ground thoroughness and documentation of streams that are not on the map will help protect the Alexauken headwaters in the future so please, when you see a small tributary or rivulet of water that is not present as a branch on the map, draw it on your map and note it on the datasheet. We will be revisiting these areas in the future to help secure that these small but important streams are recognized as part of the Alexauken Watershed.

Unmapped headwater stream channel with no water present

If you see something that looks like a natural stream channel (and is not a man-made ditch where a ditch survey would be better suitable) that has no water present in it, document this information as well. Some streams are ephemeral and dry up for part of the year in the summer.

Wetlands

Wetlands are commonly referred to as swamps, marshes, or bogs. However, many wetlands in New Jersey are forested and do not fit the classic picture of a swamp or marsh. Previously misunderstood as wastelands, wetlands are now being recognized for their vital ecological and socioeconomic contributions.

Many people grew up thinking wetlands should be drained for farming or filled in for development. But wetlands contribute to the social, economic, and environmental health of our nation in many ways:

- Wetlands protect drinking water by filtering out chemicals, pollutants, and sediments that would otherwise clog and contaminate our waters.

- Wetlands soak up runoff from heavy rains and snow melts, providing natural flood control.

- Wetlands release stored flood waters during droughts.

- Wetlands provide critical habitats for a major portion of the State's fish and wildlife, including endangered, commercial and recreational species.

- Wetlands provide high quality open space for recreation and tourism.

Many of these values were not widely appreciated until the 1970s and 1980s. By then, more than half of the nation's wetlands were destroyed. The New Jersey freshwater wetlands program protects freshwater wetlands, and upland areas within 150 feet of wetlands (sometimes called "buffers"), from development which will impair the wetlands' ability to provide the values listed above. Over the last two hundred years, the United States has lost over 117 million acres of its wetlands through dredge and fill activities, drainage, development, pollution, and natural causes. Erosion, flooding, and sedimentation has resulted. Furthermore, the decrease in wetlands has decreased populations of waterfowl, fish, and shellfish. With over 54 percent of the total wetlands in the continental United States already lost, and an additional 200,000 acres disappearing every year, protecting our remaining wetlands has become a critical national priority.

What to Look For to ID a wetland?

Here are some clues that an area might be a wetland:

- The area often has standing water;
- Vegetation in a wetland may include sedges and rushes, grasses that often look very different from typical upland species.
- The area is a low spot that holds water for several days after a heavy rain;
- The water table in the area is not far below the ground surface;
- Land contains a stream or pond, with gentle banks (you may have a fringe of wetlands along the banks)

Streamside Landuse

This information is meant to obtain general information about the entire reach you are monitoring and general information about the surrounding watershed. There are two sections to the sheet, Assessment within 50' of the stream and Assessment within ¼ mile (~1,320 feet) of the stream. The assessment within 50' of the stream can be filled out at the site while you are in the field. The ¼ mile assessment can be filled out best by driving around the watershed or looking at the aerial map (based on 2002 data) provided for your segment. This section is important to determine issues on the land so be as thorough as possible filling it out. Be sure to include and elaborate on specific types of landuse if possible. For example, it is important to note what type of livestock are present…sheep, cows, chickens, etc.

Watch Out for Construction!

The Alexauken stream, which is a C1 stream, is afforded special protections of its riparian buffer through recent NJ DEP Stormwater Regulations. The law requires that new construction activity impacting greater than a one acre area, should not impact the 300 foot buffer on either side of the stream. If you see construction (greater than one acre in size) underway that involves any type of clearing or construction within the 300 foot riparian area surrounding the stream, take photos (with date if possible), document GPS locations, and contact 1-877-WARN DEP. Be sure to get a case number and operator number when you make the report, specify the information you have obtained and clarify that construction is impacting a 300 foot buffer along a C1 stream.

Scoring For Stream Reach

Be sure to fill in this portion of the assessment when you have walked the entire reach and determined the reach start and end point. You want to consider and average the area for the entire reach for each of the components. If you are struggling with too many different conditions within a reach, you may want to split the area into separate reaches and perform a separate assessment. However, do remember that some averaging within the reach is advisable. Use the comments section below each indicator to elaborate on your scoring.

Vegetated Buffer Width (Riparian Zone)

A vegetated buffer (or riparian zone) is the vegetation found adjacent and along a streambank. A healthy riparian zone is critical to a healthy stream and the larger the buffer, the more benefits it can provide. It can be any type of ***natural vegetation*** (and does not include lawn, intensive agricultural crops (such as corn), or active grazing areas). Natural vegetation includes plants like: aquatic plants, sedges, rushes, grasses, forbs, shrubs, vines, understory trees and large trees. **Do not penalize the buffer if it includes invasive plants. Also remember that tall meadow grasses and wildflowers are considered buffer even though there are no trees or shrubs present and the meadow may be mowed on an annual basis to control invasive plants. Buffer quality below will tease out the issues of invasives and meadows.**

Riparian buffers:

- Reduce pollutants from entering the stream
- Help control erosion and stabilize streambanks
- Provide shade to keep stream temperatures optimum for aquatic life
- Provide large woody debris from fallen trees and limbs that form instream cover, create pools, stabilize the streambed, and provide habitat for stream life
- Provide fish habitat in the form of undercut banks with the "ceiling" held together by roots of woody vegetation
- Provide organic matter to fuel the base of the food chain in lower order streams
- Provide habitat and travel corridors for terrestrial animals
- Dissipate energy flow during flood events
- Often provide the only refuge areas for fish during out-of-bank flows (behind stumps, trees, logs)

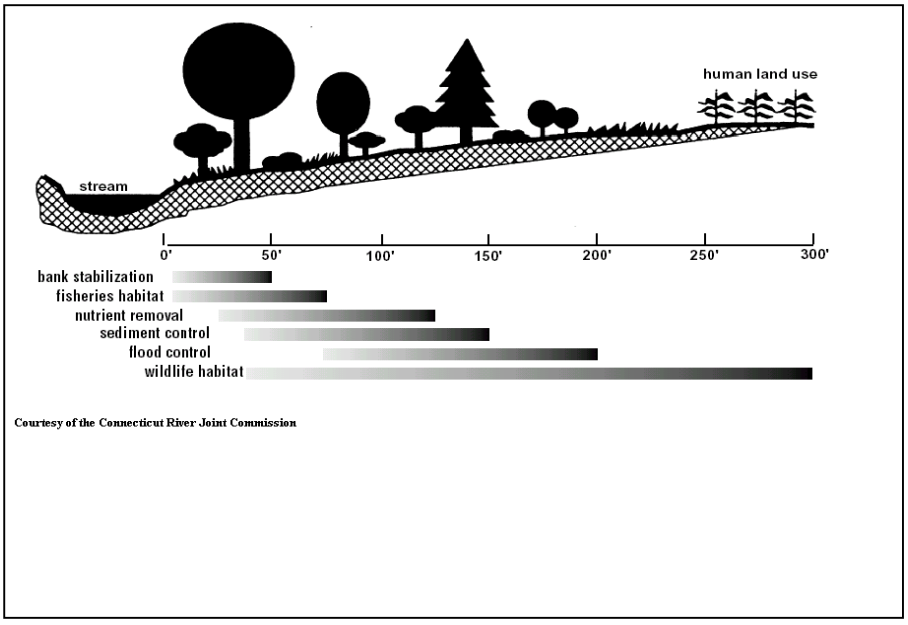


Illustration showing positive benefits of buffers –wider is better.
Courtesy of the Connecticut River Join Commission

Be sure to assess the left and right streambank buffers separately along the entire stream reach and choose a score that best averages riparian buffer width throughout the reach. (Determine left and right buffer conditions by facing downstream.) You may want to pace the distance if you are having trouble estimating distance, particularly when you first start the assessment and are training your eyes to measure distance.

Vegetated Buffer (Riparian Zone) Condition

An optimum riparian buffer has all three native habitat layers – trees, shrubs, and groundcover - present and abundant throughout. A common problem for riparian buffers is lack of understory shrubs, trees, and groundcover. Another problem is lack of regeneration. The presence of only mature vegetation and few tree seedlings indicates lack of regeneration (often caused in our area by the overpopulation of deer). Another problem plaguing our buffers and native habitats are the presence of invasive exotic plant species that out-compete native species, cutting back on diversity within the buffer. If you see a lot of one type of plant, it could be that you are seeing an invasive species. For example, in headwater areas of the Alexauken (and many other headwater streams), multi-flora rose is often present along small tributaries in very large, dense stands. Plant ID can be tricky, particularly in the winter months and some invasive plants look a lot like some of our native plants. As a general rule of thumb, most of the vines you may see growing up trees and shrubs are invasive plants such as japanese honeysuckle, asiatic bittersweet, or mile-a-minute. The one native vine you may see this winter in the woods is grape which has a characteristic shaggy bark. Be sure to refer to the Invasive Plant Guide for more pictures and guidance and remember, a picture can also help us help you determine a particular plant type. Don't stress too much if you can't ID specific plants…even the experts have a hard time with plant ID at times.

Bank Stability

Bank erosion is noted by raw banks that have loose or bare soils evident. Some bank erosion is normal for healthy streams since streams naturally move sediment through a system. Stream erosion reflects the natural process of channel migration and adjustment, whereby streams continuously meander, widen and narrow in an attempt to reach a stable equilibrium. *Some minor erosion along the outside bend of a stream is normal, particularly when there is a healthy riparian buffer root system present to help hold the outside meander bend soils in place.* Problems arise and bank erosion becomes significant when riparian buffers are degraded or where a stream is unstable because of changes in hydrology, sediment load, or isolation from its floodplain. Excessive bank erosion occurs when the watershed surrounding the stream has been altered. An example of this may be a newly constructed parking lot on the stream bank. Precipitation will hit the parking area and rush off site quickly into the stream and cause the stream flow to rapidly increase which may cause the banks to erode. The process of channel widening or downcutting (the process by which a stream is lowered in elevation due to the net loss of substrate) can worsen as streams become cut off from their floodplain. These hydrology issues can be due to inadequate stormwater management upstream, stream straightening, or the presence of dams, bridges and other manmade modifications to the stream (to name a few). High and steep banks are more susceptible to erosion or collapse. Bank scouring from high water and sediment loads can cause sloughing and scalloping of banks in areas with very poor bank stability. You might also see fallen trees or "missing trees" in areas with severe erosion as the tree root structure is compromised by bank scouring and the roots loose soil support around them.

Channel Condition:

Natural stream channels have sinuosity or meanders (bends) and usually a diverse riffle, pool, run complex. The amount of sinuosity increases as the stream energy decreases. Stream meandering generally increases as the gradient of the stream valley decreases. For example, a mountain stream running down a steep slope is always straighter than a sluggish coastal stream. Meanders in a stream slow down stream flows and help dissipate energy in the stream. Because urbanization increases the amount of stream energy as more runoff enters the stream from impervious surfaces, if often leads to straighter, higher energy, stream channel.

The relationship of water and sediment is the basis for the dynamic equilibrium that maintains the form and function of the river channel. The energy of the river (water velocity and depth) should be in balance with the bedload (volume and particle size of the sediment). Any change in the flow regime alters the balance. Natural stream channels have access to their floodplains, the flat areas of land adjacent to a stream that is formed by current flood processes. These floodplains are critical to the stream's health, particularly when flows are high, the stream can overflow onto the floodplain, dissipating its energy, nourishing the soils and dropping sediment loads. Downcutting, or the process by which a stream bottom is lowered in elevation due to the net loss of substrate (stream bottom), can limit the streams access to its floodplain. As a stream gets cut off from its floodplain, flows intensify and the stream may begin to straighten.

The presence of braided channels (a stream with three or more smaller channels) and gravel bars are also indicative of altered stream energy and an unstable stream. Signs of channelization (stream straightening) of a stream can include an unnaturally straight section of a stream, high banks, dikes or berms, and lack of flow diversity (few pools, riffles, and run). Older impacts may be evident in areas where a road follows a stream as the stream may have been manipulated in the past to allow for the road. Some modifications of streams have an impact to the stream more than others. For example, channelization (stream straightening) and dams affect a stream more than the presence of pilings or a bridge for road crossings.

Manure Presence

Manure from livestock may enter the water if livestock have access to the stream or from runoff from grazing areas adjacent to the stream. Look for manure piles along agricultural areas and pasture lands. Signs of livestock paths leading to or near streams may also indicate the probability of manure to enter the stream. Concentrated Animal Feed Operations (CAFOs) may also have lagoons where vast amounts of manure are kept in holding containers. Also consider the spreading of manure on agricultural fields – using manure on fields is a natural way to amend the soil and use up waste produced by livestock but applying too much manure that the soil is unable to assimilate can cause nutrient runoff. Also take note of large numbers of waterfowl (i.e. Canada geese), usually found along impoundments (ponds) where manicured grass is maintained. Public parks can also be a source of runoff if dog owners are not cleaning up after their pets. Finally, remember that septic systems from households can malfunction if not maintained properly or sited at the right location. Signs of on-lot septic problems include: sewer odors, sponginess around septic tank or absorption area, and surfacing raw sewage. Areas with stagnant or slow-moving water may have moderate to dense amounts of vegetation or algal blooms, indicating localized enrichment from manure.

Available Cover for Aquatic Life

Observe the number of different habitat and cover types within a representative subsection of the assessment reach that is equal in length to five times the stream channel width. **Each cover type must be present in appreciable amounts to score**. Cover types are described below:

- Logs/large woody debris – fallen trees or tree parts that provide structure and attachment for aquatic insects and hiding places for fish
- Deep pools – areas characterized by a smooth undisturbed surface and deep enough to provide protective cover for fish
- Overhanging vegetation – from trees, shrubs and grasses that hang immediately over the stream surface providing shade and cover.
- Boulders/cobble –boulders are rounded stones more than 10 inches in diameter or larger slabs more than 10 inches in length; cobbles are stones between 2.5 and 10 inches in diameter
- Undercut banks – Eroded areas extending horizontally beneath the surface of the bank forming underwater pockets used by fish for hiding and protection
- Thick root mats – often from streamside vegetation or plants growing in the water
- Dense plant beds – beds of emergent aquatic vegetation thick enough to provide invertebrate attachment and fish cover
- Riffles – A shallow section in a stream where water is breaking over rocks, wood, or other partly submerged debris and producing surface agitation.
- Isolated/backwater pools – areas disconnected from the main channel, characterized by a lack of flow except in periods of high water
- Course gravel substrate – rocks on the stream bottom that are pea to tennis ball sized which can be used by fish for spawning

Barriers to Fish Migration

Barriers may prevent the movement or migration of fish, deny access to important breeding and foraging habitats, and isolate populations of fish and other aquatic organisms. Large dams with impounded water will be obvious during your observations. Look for structures that may not involve a drop but still present an obstacle. For example, some culverts with slopes and insufficient water depth can be a barrier to fish movement. Beaver dams generally do not prevent fish migration but note their presence if you encounter them.

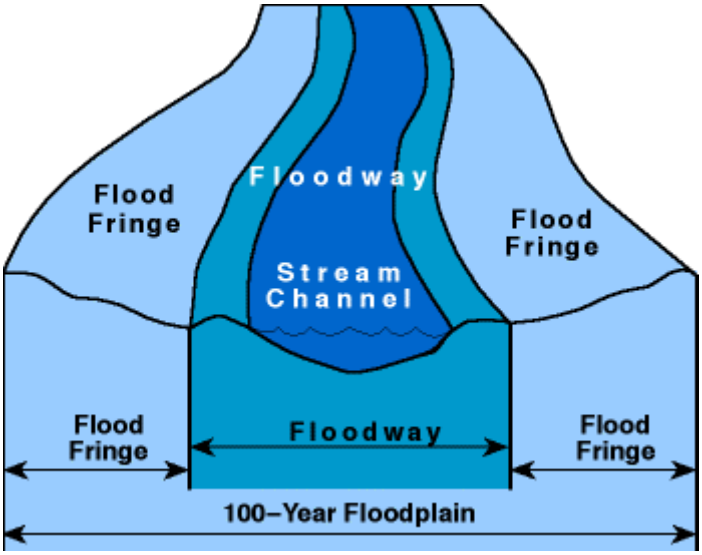
Velocity/Depth Variability

Look for a good variety of flow and depth regimes within each reach. Distinguishing between these four different types can be a challenge….nature tends not to make noticeable boundaries, especially in a stream. The most important thing is to be consistent throughout your reach. Look for locations where the water flow or turbulence changes. A stream with a natural riffle-pool-run complex will likely have all four variables while a straightened channel will not. Pools, often found on the outside meander bend usually account for slow-deep habitat where fish are able to hide and rest. Fast-shallow areas are usually found in riffle habitats and fast-deep areas are usually located in run habitat. Run habitat, fast moving sections of the stream with the majority of stream flow and little surface agitation, often breaks up pools and riffle locations. Pools and riffles refer to the mixture of flows and depths that create in-stream habitat for invertebrates and fish. Pools are deeper than the average stream depth with slower moving water than the average flow appearance. Riffles are shallower depth areas of the stream segment with faster, turbulent water running over gravel and/or rocks. This description will be dependent upon the stream gradient. Pools and riffles are typical of healthy high gradient streams; you may not find noticeable defined pools or riffles in a low gradient stream.

Floodplain Encroachment

Flooding is a natural and beneficial function of streams and the stream and floodplain exist in dynamic equilibrium, having evolved with the climate and geology of the area. The relationship of water and sediment is the basis for the dynamic equilibrium that maintains the form and function of the river channel. The energy of the river (water velocity and depth) should be in balance with the bedload (volume and particle size of the sediment). Any change in the flow regime alters the balance. Floods occur when rivers, streams or lakes overflow their banks and spill onto the adjoining land area, which is called a floodplain. Loss of life and property can result when people build structures and develop in flood hazard areas.

A floodplain is the lateral flat area along the streambanks that provides natural flooding and erosion control. Floodplains allow for an area for a stream, lake, or pond to overflow its banks during times of high water, provide an area for sediment to drop from the channel, help replenish groundwater, dissipate stream flows and energy, and provide nutrients and food for stream life. Throughout history, humans have continued to alter, fill, and develop manmade structures in the floodplain which puts people in harms way and causes flooding problems downstream. In some cases, natural geology and rocks of the area may limit the floodplain area.



Compliments of Ohio Department of Natural Resources, Division of Water Floodplain Management Program

In general, the regulated flood plain is the area that would be covered by water during the "100 year storm"- a storm which has a 1 in 100 chance of occurring in any one year period. The term "100-year flood" has caused much confusion for people not familiar with statistics. Another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage. Even though there may only be a one-percent chance in any given year, over a 30-year period there is a 26% chance that a structure located in the floodplain will be flooded.

Chance of Flooding over a Period of Years				
Time	**Flood Size**			
Period	10- year	25-year	50-year	100-year
1 year	10 %	4 %	2 %	1 %
10 years	65 %	34 %	18 %	10 %
20 years	88 %	56 %	33 %	18 %
30 years	96 %	71 %	45 %	26 %
50 years	99 %	87 %	64 %	39 %

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During a 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that it will be hit by a 10-year flood. Compare those odds to the only 1-2 % chance that the house will catch fire during the same 30-year mortgage[7].

Other Observations:

Fill in any other observations made about the reach. This can include wildlife observed, anything that appears out of the ordinary or information obtained by talking with local residents concerning the history of land use in the area.

As you go along, we have included many areas for you to write in comments and notes, please use them to elaborate on you scoring.

[7] Ohio Floodplain Management Handbook, Ohio Department of Natural Resources, Division of Water Floodplain Management Program, 2005. www.dnr.state.oh.us

Photo Inventory Sheet & Tips for Taking Good Photos:

Label photos with exposure #, date, GPS location, description, and, photographer on the photo inventory sheet. Be sure to mark photo-point locations and orientation on map. This field sheet should be filled out AS photos are being taken for better documentation. Use objects placed in the picture to help with scale. We recommend having two clipboards, one for your assessment and the other for the photo log sheet. This way you won't forget to take photos and document your images as you do the assessment. You can use one of our disposable cameras or your own camera for photos. If possible, please supply photos in electronic format on CD but be sure to include a log and caption so we are able to match the photo with the situation.

"Data is in the eye of the beholder." You may feel as though your photos convey little information. On the contrary, Delaware Riverkeeper Network staff are often clued into other aspects of the area that you may not be aware of or have the knowledge of such as hydrology, new invasive species present, and other changes to the site. So, click away! We can never have too many photos (accompanied with good notes by you) for your stream segment!

When taking a photo:

- ✓ Include a ruler, person, automobile, or other object to convey the scale of the image. Cardboard arrows can also come in handy to highlight specific points you are trying to convey in the photo. A clipboard or pen work good for scale too.

- ✓ Close view photographs taken from the north (facing south) will minimize shadows

- ✓ **Give detailed information about the photo**: record time and date of photo, what the photo is meant to highlight, and where it was taken. You can draw a small map on the back of the photo or mark where the photo was taken on your site diagram.

- ✓ **Record your exposure information!** We've said this before but cannot emphasize this enough. Relying on your memory is not a good idea. Record photo information on the data sheet after each shot. The assessment has a full page dedicated to recording your photo information so please use it. Another technique is to **use a photo sign. A picture of a sign marked with the location, subject, date and time is taken just prior to taking the intended photo.** This is especially feasible with a digital camera, in which case the photo can be deleted after proper records have been made.

- ✓ **Maintain a level (horizontal) camera view**, unless the terrain is sloped.

- ✓ **Watch the weather.** Especially overcast days are not good for taking pictures. The mornings and late afternoons are best, when sunlight does not drown out the photo subjects. Contrast is maximized during these times. Medium and long view photos are best shot with the **sun at the photographer's back**.

Date (mm/dd/yy): _____ **Segment ID:** _____ **Reach No:** _____

START Time:_____ **AM/PM** **Start GPS: N** ____° ____'____" **W**_____° ____'____"

Description: _____

END Time: _____ **AM/PM** **End GPS: N** ____° ____'____" **W**_____° ____'____"

Description: _____

Stream Reach Order (from map): _____

Starting Point: Downstream to upstream ☐ **Upstream to downstream** ☐

Monitor Name(s)_____

Reach Accessibility & Good Locations for Further Sampling:

Reach Accessibility (CWP)

Good: Open area in public ownership and near public road, sufficient space for sampling and easy and safe access to stream – nice slope, easy to walk down and wade in stream	**Fair:** Must traverse private property to access stream.	**Poor**: Must cross wetland, steep slopes, or sensitive areas to access stream. Steep banks difficult to traverse.	**SCORE**
5	3	1	

Document good locations for future sampling (if available) (take photos):

Description of Access Point	**GPS Coordinates (N** __° __'__" **W**__° __'__")	**Notes on site**

Document Severe Bank Erosion Areas (take photos):

GPS Coordinates/Description (N __° __'__" **W**__° __'__")	**Approx. Length of Erosion (ft)**	**Existing Riparian Width (ft)? <25, 25-50', 50-75', 75-100', >100'**	**Ownership (priv/pub)**
		<25; 25-50', 50-75', 75-100', >100'	
		<25; 25-50', 50-75', 75-100', >100'	
		<25; 25-50', 50-75', 75-100', >100'	

Did you fill out a Drainage Ditch & Stormwater Outfall Survey for this Reach? Yes ☐ **No** ☐

Did you fill out an Invasive Plant Survey for this Reach? Yes ☐ **No** ☐

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Mapping Exceptional Resources and Habitat (NJ):

Type	**Within 50' of stream**	**GPS Coordinates**(N __° __'__" W__° __'__")**/ Description/Comments**
1. Vernal pools		
2. Unmapped headwater streams with water present		
3. Unmapped headwater stream channel with no water present		
4. Wetlands		
Other (grasslands/meadows):		

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Streamside Landuse (NJ): (1. Present 2. Clearly impacting the stream)

Type of Use	Within 50' of top of streambank (field obs.)	Within ¼ mile of site (map/windshield)	If significant impact evident, GPS coordinates/ Description of impact/Comments
1. Agricultural grazing land (specify animal type)			
2. Agricultural cropland (soy, hay, corn)			
3. Agricultural feed lots/animal holding areas			
Do livestock have access to stream?	Yes	No	
4. Inactive agricultural land/fields			
5. Residential single-family housing			
6. Residential multifamily housing			
7. Industrial (list type if known)			
8. Commercial/Institutional			
9. Residential Lawns			
10. Waterfowl (w/approx number)			
11. Recreational hiking/paths			
12. Horse trails			
13. Paved Roads			
14. Unpaved Roads			
15. Road drainage impacts			
16. Timbering/woodland management			
17. Construction Underway for:			Note if 300' buffer on each side of stream is protected at >1 acre construction sites. If not, take pictures, record exact location and contact 1-877-WARNDEP.
18. Housing development			
19. Commercial			
20. Road/bridge construction repair			
21. Utility impacts/crossings (gas pipelines, electrical lines)			
22. ATV and recreational vehicle crossings/damage			
23. Deer herbivory/browse			
Other:			

Notes (biggest problem(s) you see in surrounding landuse of reach, etc.): _____

_____

_____

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Scoring Descriptions for Stream Reach

For any given criteria, provide a score between 1 and 10. Examples for scores of 1,3,7, and 10 are provided. You may score in between (a 2,6, or 8) if you feel it better describes the conditions. *Always face downstream to determine left and right banks.*

Vegetated Buffer Width (Riparian Zone) (assess left and right banks separately)

Width of buffer zone >50ft; human activities (i.e. parking lots, roads, clear-cuts, lawns crops) have not impacted zone.	Width of buffer zone 25-50 ft; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet; little or no riparian vegetation due to human activities.	**SCORE**
Left Bank: 10	7	3	1	**Left Bank:**
Right Bank: 10	7	3	1	**Right Bank:**

Comments: _____

Vegetated Buffer Condition (assess left and right banks separately)

All 3 habitat layers present and abundant. Mostly native species with low number of invasive plants. Undisturbed.	One habitat layer impaired or not present. Scattered presence of invasive plants, but community mostly intact. Minimal disturbance.	Two habitat layers impaired or not present. Invasive species present throughout. Degraded.	Two or more habitat layers missing. Low diversity of species, mostly invasive plants. Severely degraded.	**SCORE**
Left Bank: 10	7	3	1	**Left Bank:**
Right Bank: 10	7	3	1	**Right Bank:**

Comments: _____

Bank Stability (assess left and right banks separately)

Banks stable; infrequent raw banks up to 6 inches high generally. <5% of bank in reach has areas of this erosion	Moderately stable; some erosion intermittently at outcurves & constrictions. Raw banks may be up to 12". Less than 30% of bank in reach has areas of erosion to above extent	Moderately unstable with significant 12" to 24" high cuts. Root mat overhangs & sloughing present. 30-60% of bank within reach has areas of erosion to above extent	Unstable with almost continuous cuts, some greater than 24" high. Failure of overhangs common. 60-100% of bank has erosion scars to above extent including erosion along straight sections	**SCORE**
Left Bank: 10	7	5	1	
Right Bank: 10	7	5	1	

Comments: _____

Channel Condition (can be natural or man-made)

Natural channel; no structures, dikes, mid-channel gravel bars. No channelization or stream straightening evident.	Evidence of past channel alteration or transition but with significant recovery of channel, banks. Any dikes/levies are set back to provide access to adequate floodplain	Altered channel: <50% of reach with riprap, channelization mid-channel gravel bars, braided channel. Access to floodplain is restricted and stream cannot flood over banks easily	Stream channel is actively downcutting or widening. Greater than 50% of reach is riprapped, channelized or gravel bars. Access to floodplain is restricted	**SCORE**
10	7	3	1	

Comments: _____

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Manure Presence

No evidence of livestock or waterfowl access to riparian zone. No evidence of septic problems.	Evidence of livestock or waterfowl access to riparian zone	Occasional manure or waterfowl in stream or waste or septic system located in the floodplain	Extensive amount of manure on banks or large numbers of waterfowl in stream. OR Untreated human waste or septic problems evident	**SCORE**
10	5	3	1	

Comments: _____

Available Cover for Aquatic Life

Cover types: fine woody debris, large woody debris, submerged logs, deep pools, isolated/backwater pools, undercut banks, overhanging vegetation, dense plant beds, leaf packs, thick root mats, riffles, boulders, cobble substrate, coarse gravel substrate. Each habitat type must be in appreciable amounts.

Greater than 7 cover types available	At least 7 cover types available	3 to 4 cover types available	1 to 2 cover types available	**SCORE**
10	7	5	3	

Comments: _____

Barriers to Fish Movement

No barriers.	Drop structures, culverts or diversions (less than 1 foot drop) within reach	Drop structures, culverts, or diversions (greater than 1 foot drop) within reach	Drop structures, culverts, or diversions (greater than 3 feet drop) within reach	**SCORE**
10	7	3	1	

Comments: _____

Velocity/Depth Variability

All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, and fast-shallow)	Only 3 of the 4 regimes present	Only 2 of the 4 habitat regimes present	Dominated by 1 velocity/depth regime (usually slow-deep)	**SCORE**
10	7	3	1	

Comments: _____

Floodplain Encroachment

No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill materials, land development, or manmade structures, but not effecting floodplain function.	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e., fill material, land development or manmade structures). Significant effect on floodplain function.	**SCORE**
10	7	3	1	

Comments: _____

TOTAL SCORE _____ (add up all parameters scored and record total)

Drop off completed datasheets, photos, GPS Units, etc. to West Amwell Township during regular business hours by March 27th at the latest. It is important you complete the survey on time so results can be used. You can also drop off information at the Delaware Riverkeeper Network office in Washington Crossing, PA, but call first to make sure someone will be there, 215-369-1188.

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Photo Inventory Sheet

Label photos with exposure #, date, location, description, and, photographer. Be sure to mark photo-point locations and orientation on map. This field sheet should be filled out AS photos are being taken for better documentation. Use objects placed in the picture to help with scale.

Photo Points

Exposure #	Reach ID	GPS Location (N __° __'__" W__° __'__")	Description

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Alexauken Creek Drainage Ditch & Stormwater Outfall Survey

(based on NJ DEP VAP)

DRAINAGE DITCH

Date (mm/dd/yy): _____ **Segment ID:** _____ **Reach No:** _____

Time:_____ **Observer Name(s):** _____

Location Description: _____

Drainage Ditch Reference Number: _____

Drainage Ditch Source # _____ 1. Unknown 2. Road drainage 3. Parking Lot 4. Agricultural field 5. Livestock Operation 6. Settlement Basin/Stormwater Detention Pond (Wet) 7 Settlement Basin/Stormwater Detention Pond (Dry)

GPS Coordinates of Ditch at Stream: Lat N___° ____'____" **Long W**___° ____'____"

Ditch Lining: _____1. Stone 2. Vegetation 3. Concrete **Ditch Is:** _____1. Stable 2. Eroding

Ditch Flow: _____1. None 2. Intermittent 3. Steady

Flow Appearance: _____1. Clear 2. Turbid 3. Oily 4. Foamy 5. Colored _____

Stream channel downstream: _____ 1. Stable 2. Eroded

Comments: (indicate locations on map):

Photos Taken (record info on photo log)? Yes ☐ No ☐

Ditch Severity (circle #):

Heavy discharge/flow with a distinct color and/or a strong smell or stormwater runoff problem. The amount of discharge is significant compared to the amt of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless or stormwater runoff. If the discharge has a color and/or odor, the amt of discharge is very small compared to the stream's baseflow and any impact appears minor/localized.	Ditch does not have dry weather discharge; staining; or appearance of causing any erosion problems
5 **4**	**3**	**2** **1**

OUTFALL PIPE

Date (mm/dd/yy): _____ **Segment ID:** _____ **Reach No.** : _____

Time:_____ **Observer Name(s):** _____

Location Description: _____

Outfall Pipe Reference # _____ **Pipe Diameter:** _____**(in/ft)**

Outfall Type #: _____ 1. Unknown 2. Residential discharge 3. Industrial Discharge (NJPDES # _____) 4. Combined sewer overflow 5. Storm Drain 6 Settlement Basin/Stormwater Detention Pond (Wet) 7 Settlement Basin/Stormwater Detention Pond (Dry) 8 Other

Origination Point (if able to follow ditch to origin): _____

Pipe Material: _____ 1. Concrete 2. Steel 3. PVC 4. Clay 5. Other _____

GPS Coord. of Pipe at Stream: Lat ___ ____'____" **Long**__ ____'____" Pipe Location: 1. In stream 2. In stream bank 3. Near stream

Pipe Flow/Appearance: _____ 1. None 2. Trickle 3. Intermittent 4. Steady 5. Heavy

Flow Color:_____**Photos Take**: **Yes ☐ No ☐**

Stream channel downstream: _____ 1. Stable 2. Eroded

Pipe Severity (circle #):

Heavy discharge with a distinct color and/or a strong smell or stormwater runoff problem. The amount of discharge is significant compared to the amt of normal flow in receiving stream; discharge appears to be having a significant impact downstream and erosion near discharge is great.	Small discharge; flow mostly clear and odorless or stormwater runoff. If the discharge has a color and/or odor, the amt of discharge is very small compared to the stream's baseflow and any impact appears minor/localized with little erosion evident.	Ditch does not have dry weather discharge; staining; or appearance of causing any erosion problems
5 **4**	**3**	**2** **1**

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.

Date (mm/dd/yy): _____ **Segment ID:** _____ **Reach No:** _____

Time: _____ **Observer Name(s):** _____

Invasive Plant Survey:

Are there invasive plant species present along the stream reach?

☐ Yes; ☐ No Comments: _____

_____

_____

If invasive plant species are present, specify type and extent of colonization throughout reach below:

Invasive Plant	**Extent Of Damage** *L-local, S-scattered, W-widespread*
Multiflora rose (S) (*Rosa multiflora*)	
Japanese honeysuckles (*Lonicera*) (V/S)	
Oriental bittersweet (V) (*Celastrus orbiculatus*)	
Purple loosestrife (H) (*Lythrum salicaria*)	
Winged burning bush (S) (*Euonymus alata*)	
Norway maple (T) (*Acer platanoides)*	
This is not a comprehensive list of invasive plants. Refer to the NPS Handbook for other invaders. S= shrub; V= vine; H= herbaceous; T= tree	

Invasive Plant	**Extent Of Damage** *L-local, S-scattered, W-widespread*
English Ivy (V) *(Hedera helix)*	
Common reed (H) (*Phragmites australis*)	
Japanese knotweed (H) (*Polygonum cuspidatum*)	
Autumn olive (S) (*Elaeagnus umbellata*)	
Garlic mustard (H) *(Alliaria petiolata)*	
Others:	

Comments: _____

_____

_____

_____

_____

_____

_____

_____

Segment _____ Reach _____

If you find hazardous material, illegal discharges or dumping, see a spill impacting the stream, etc. call NJ DEP hotline: 1-877-WARN DEP. Take pictures (with date) and document exact location of incident for follow-up.