Stream Gradient and Riparian Description

The following stream gradient (Figure 21) helps characterize streams by offering a cross-sectional representation of stream fall from its source to its mouth for each evaluated stream in the Upper Tuscarawas River Watershed. Typically, streams with a steep gradient have more energy available for stream flow, which increases its capacity to headwardly erode transporting sediment loads and debris downstream, depositing its stream load as the stream gradient diminishes as it approaches the convergence with the mainstem or higher order stream or local base level.

The following description of each evaluated watercourse is based on aerial photo interpretations of the Upper Tuscarawas River Watershed, and is provided so the reader will have a better understanding of the existing conditions of the riparian corridor within the watershed.

The Tuscarawas River headwaters begin in Lake Township of Stark County, flowing northwesterly through Springfield Township, Coventry Township and a portion of the City of Akron. Its average stream gradient is approximately 11.75 feet/mile (Figure 21) with 0.22 percent slope (Table 25). The aerial photos show that the Tuscarawas River riparian habitat is fragmented and is being pressured by increasing urbanization. Much of the Tuscarawas River in the Stark County portion appears to have been modified by channelization and diminished riparian width and cover. The Ohio EPA 305b report (Appendix A) identified removal of riparian vegetation as a souce of impairment to assessed segments of the Tuscarawas River. However, even though the Tuscarawas River is pressured by development, three sections possess high quality habitat. These sections include stream segments along the area known as the Rubber City Wildlife Area between Pickle and Arlington Roads, the Firestone Metro Park (Warren Road to South Main Street) and from just west of South Main Street to the confluence of Long Lake.

Myersville Creek enters the Tuscarawas River near river mile (R.M.) 8.2. Its average stream gradient is approximately 9.28 feet/mile (Figure 21) with 0.18 percent slope (Table 25). Myersville Creek flows south, originally from the southwest corner of the 619 and Mogadore Road intersection. The creek appears to be channelized or modified along its entire course within Stark County, flowing through fragmented habitat in mix of residential, shrub, old field and wooded areas. As Myersville Creek enters Summit County, it turns north, initially flowing through an agricultural zone until it reaches Hickman Road where housing density increases up to Raber Road. Once north of Raber Road, the riparian habitat, up to the confluence with the Tuscarawas River, greatly improves, flowing through primarily forested/swamp areas interspersed with a few segments affected by residential areas and mining activity.

Graybill Creek enters Myersville Creek at approximately R.M. 3.0. Its average stream gradient is approximately 34.59 feet/mile (Figure 21) with 0.65 percent slope (Table 25). Graybill Creek begins at the Akron/Canton Industrial Park and flows east through an urbanized area for the first five segments. East of Massillon Road, the stream flows

primarily through agricultural areas with limited riparian cover and width. Graybill Creek habitat appears to have been directly affected by increased housing, development and golf courses. Numerous segments have little to no riparian cover or riparian width due to riparian corridor destruction, and in fact two segments of Graybill Creek have been culverted or piped.

Table 25
Average Stream Gradient and Percent of Slope

Stream Name	Average Stream Gradient	Percent of Slope
	height/length = avg. stream gradient	vertical distance/horizontal distance x 100 = % of slope
Tuscarawas River Mainstem	199'/16.93 mi. = 11.75'/mi	199'/89,400' X 100 = .22% of slope
Myersville Creek	77'/8.30 mi. = 9.28'/mi	77'/43,800' X 100 = .18% of slope
Graybill Creek	110'/3.18 mi. = 34.59'/mi	110'/16,800' X 100 = .65% of slope
Wonder Lake Creek	191'/3.41 mi. = 56.01'/mi	191'/18,000' X 100 = 1.06% of slope
Cottage Grove Creek	171'/3.86 mi. = 44.30'/mi	171'/20,400' X 100 = .84% of slope
Nimisila Creek	178'/6.93 mi. = 25.69'/mi	178'/36,600' X 100 = .49% of slope

Cottage Grove Creek is a tributary of Mud Lake. Its average stream gradient is approximately 44.30 feet/mile (Figure 21) with 0.84 percent slope (Table 25). Cottage Grove Creek begins east of Arlington Road where the first seven segments show riparian habitat modification. However, once west of Arlington Road, the stream flows through fragmented riparian habitat dominated by agricultural land use and high quality habitat to Mud Lake, with the exception of two commercialized segments near the intersection of State Route 619 and Main Street.

Wonder Lake Creek is a tributary to a bay of East Reservoir known as Cottage Grove Lake. Its average stream gradient is 56.01 feet/mile (Figure 21) with 0.84 percent slope (Table 25). Wonder Lake Creek begins just south of the intersection of 619 and Pickle Road and north of I-77. The headwaters portion of the stream has been severely altered by housing and commercial development to Arlington Road. However, east of Arlington Road the stream enters high quality habitat, with only a few segments affected by residential areas.

Nimisila Creek is a tributary to Nimisila Lake. Its average stream gradient is 25.69 feet/mile (Figure 21) with 0.49 percent slope (Table 25). Nimisila Creek begins west of the Massillon Road and Wise Road intersection flowing south through fragmented habitat to Koons Road where the riparian habitat improves without being fragmented. The stream then flows west through Singer Lake, which is surrounded by housing.

Once the stream exits Singer Lake, the riparian habitat consists mostly of wide to moderate riparian width consisting of forest/swamp and shrub/old field flood plain quality prior to entering Lake Noah where the stream may continue toward either Comet Lake or to Nimisila Lake, retaining its high quality riparian habitat to the confluence of Nimisila Lake.

Conclusion

Based on the results of the riparian habitat evaluation for the watershed, and in comparison to a 1996 NEFCO Upper Tuscarawas River riparian evaluation that used 1990 aerial photos, NEFCO has been able to conclude that residential and commercial development within the watershed continue to threaten riparian habitat as they had in the previous study. Furthermore, the evaluation determined that residential and commercial development pressures in the watershed continue to exacerbate the loss of riparian habitat through habitat modification caused by channelization, streambank alteration, stream burial, removal of riparian vegetation, and an increase in impervious surfaces. Such impacts contribute to the instability of riparian corridor ecosystems, and raise serious concerns regarding water quality issues by increasing the amount of storm water runoff, streambank erosion, sedimentation, loss of shading, and the inability to serve as filter areas to trap sediment. If the trend continues, serious problems may also develop from storm water runoff, i.e. pollutant loading, increased peak flows, and velocity of water in streams caused by storm events. Further, flooding from exacerbated storm water runoff is likely to be problematic to downstream homeowners who live along the affected watercourse.

The riparian habitat evaluation revealed that overall 34.5 percent of the six waterways were of high quality habitat. The 34.5 percent of high quality habitat is a decrease from the 1990 data set in which 55 percent (NEFCO, 1996, p. 39) of the riparian corridor consisted of high quality habitat. One should be cautious with regard to the significant drop of high quality habitat because interpretation of the blue line aerial photos is subjective even when one follows a specific methodology. Table 24 indicates that Myersville Creek had the highest percentage of high quality habitat (39.50 percent) while Graybill Creek, unquestionably the stream that is the most impacted by development pressure, received the lowest percentage of high quality riparian habitat with only 19.01 percent.

Table 22 indicates that the following streams received average riparian habitat scores: Tuscarawas River - 4.23; Myersville Creek - 4.63; Graybill Creek - 2.80; Wonder Lake Creek - 4.15; Cottage Grove Creek - 4.13; and Nimisila Creek - 4.29. Consequently, Graybill Creek's 2.80 average riparian habitat score, coupled with its 19.01 percent of high quality habitat, should be regarded as a "priority" stream for restoration efforts. However, one must consider whether it is reasonable and logical to target a stream that has already been so adversely impacted by development because such a stream may be too far gone to make a difference. Figure 14, a distribution of riparian habitat

scores, could be used to target severely altered riparian segments for remediation activities or target areas with intact riparian habitat for protection/preservation efforts.

V. Portage Lakes Task Force

Summary

The Portage Lakes Task Force (PLTF) was formed to assist with efforts to protect and/or restore water quality in the Upper Tuscarawas River Watershed. The PLTF includes representatives from state and local governments, citizens groups, and members of the community. Members of the PLTF meet as needed to review watershed projects and provide feedback to improve the effectiveness of such projects. Two sets of PLTF Meetings were held in 1998 to evaluate existing threats to water quality and review the initial watershed action plan. This report provides an overview of the meetings, materials from the meetings, and a discussion of the results.

Each set of meetings contained an afternoon and an evening meeting. The first set of meetings identified potential pollution sources in the watershed and participants discussed their possible effects on surface and/or ground water quality. The second set of meetings focused on a review of the initial watershed action plan. These meetings assisted in summarizing information from previous meetings and reports in addition to new information.

Introduction

A multi-faceted approach is necessary to protect and restore healthy water quality in the Upper Tuscarawas River Watershed. Participation by several agencies responsible for land stewardship would be a cost effective activity to undertake as a component to a successful action plan. This would capitalize on the expertise and resources from a variety of agencies. The action plan needs to coordinate tasks and work elements wherever possible to maximize the benefits of protecting and restoring water quality.

Discussion

A variety of agencies and organizations are included in the PLTF in an attempt to achieve a balance of perspective and to identify all possible resources for future work. Organizations and agencies identified include the local Home Builders Association, local health departments, SWCDs, local planning departments, Ohio EPA, ODNR and concerned citizen groups. A list of the individuals and agencies is included in Appendix Q.

The first set of meetings took place on June 22 and August 18, 1998. The purpose was to introduce new comers to the watershed, review previous meetings and reports, provide an overview of the work plan, and evaluate potential pollution sources within the watershed. Copies of the news release, meeting announcement, agenda, sign-in sheet, and meeting materials are included in Appendix F. The June 22 meeting

participants felt that an additional potential pollution source should be included on the list - Giant Canada Geese.

Two home owners who attended the August 18 meeting expressed concern regarding an exposed Marathon pipeline in subwatershed 2. Meeting participants felt that sod farms should be included in the potential pollution sources. The president and members of the grassroots group Concerned Citizens of Lake Township (CCLT) voiced concerns regarding the Industrial Excess Landfill (IEL) and its potential to impair surface and/or ground water quality.

The second set of meetings took place on October 14 and October 21, 1998. The result of the Pollution Potential Ratings and an overview of the Critical Resources and Riparian Zone Analysis were presented. The primary focus of these meetings was to evaluate the initial Watershed Action Plan. Copies of the news release, meeting announcement, agenda, sign-in sheet, and meeting materials are included in Appendix G. A representative of the Portage Lakes Advisory Council (PLAC) voiced concerns pertaining to a future area of development known as the "Dollar Lake Project." Other meeting participants recommended that establishing local/area household hazardous waste drop-off facilities or pick-up days should be included in the Watershed Action Plan. Other action plan recommendations included encouraging proper authorities to create an appropriate life-span for underground storage tanks (USTs) and requiring replacement of tanks after this determined life-span, and locating future water line extensions to assist in determining the potential for well abandonment.

Conclusion

The PLTF can serve as a key ingredient to the success of the Watershed Action Plan as it orchestrates the team approach to solving the water quality problems in the watershed. However; the PLTF Meetings in 1998, which were open to the public, revealed the need for greater participation at such meetings.

There appeared to be good support during PLTF Meetings held in 1996 for initiating a management committee with local leaders using NEFCO, PLAC, SWCD, and other agencies as the base. The committee would be refined to involve the public and formalize their organization as a working coalition from this base of agencies. The coalition could obtain funding for projects and coordinate intercommunity actions. NEFCO's role would be to facilitate and support the coalition; however, a grassroots organization would be the best group to accomplish the actions.

VI. Watershed Action Plan

Summary

NEFCO utilized the results from the public meetings and the ratings of the Potential Pollution Sources to guide the formation of the Upper Tuscarawas River Watershed Action Plan. Previous reports and additional information, pertaining to nonpoint and point source pollution, also aided in the creation of this plan.

First, problems were identified, which lead to the development of goals, objectives, actions and priority areas. After each objective was determined, they were assigned one or more actions to achieve the desired goal. Possible funding sources, estimated time frames, expected improvements, and evaluations for each action were included during the final stages of the plan.

Introduction

A watershed action plan is simply a strategic action plan focusing on watershed issues. The ultimate goal for a watershed action plan is the restoration or preservation of beneficial uses within the watershed. These include unrestricted consumption of fish and wildlife and drinking water, restoration of aquatic and terrestrial biotic communities and their habitats, and unrestricted recreational and commercial uses (C.R.R.A.P., 1992, pp. 2-19). Every watershed is unique and strategies to protect and/or restore them should reflect this. Each watershed has specific characteristics and problems related to a variety of factors, such as geography, geology, population density, economics, and present water quality. To assist in the plan's effectiveness, an inventory of possible sources of pollution in the watershed were identified from previous reports and recent research, and evaluated based on their relative contribution of pollutants. This is important since the water quality at any point in a stream is the product of all natural and human activities in the drainage area above that point (Ohio EPA 1997, pp.2-3).

The development of a watershed action plan for the Upper Tuscarawas River Watershed involves an itemization of the problems, priorities and activities the PLTF and other local organizations would like to address. It provides guidance by outlining a strategy to address water quality concerns. The process of developing a watershed action plan elicits a comprehensive understanding of water resources and the various interests involved. As a result of this plan, NEFCO hopes to promote a better perception of pollution sources and attainable solutions. This will pave the way for the next phase--feasibility and implementation; once additional funding is available.

Discussion

Properly managing urban, suburban and rural land uses along the Tuscarawas River, its tributaries and the Portage Lakes will improve the quality and productivity of this valuable natural resource. The Upper Tuscarawas River Watershed Action Plan is intended to guide the PLTF and other local organizations in their efforts to assist residents, developers, business owners, farmers, government officials, property owners and others in meeting this challenge. After existing water quality and possible pollution sources were evaluated, seven goals were identified. These are listed below:

Please note: These numbers do not necessarily refer to the order which goals should be addressed. However; goals 1-3 directly reflect the identified potential pollution sources with the highest potential to impair surface and/or ground water quality (Table 19 and Appendix I).

1. Reduce nutrient and bacteria loads, from fecal contamination, in lakes and streams
2. Decrease levels of toxic substances (heavy metals, oil/petroleum products, etc.) entering surface and/or ground water
3. Reduce impacts from sediment/siltation in lakes and streams
4. Protect and/or restore shorelines and riparian corridors in selected wetlands, lakes and streams
5. Reduce fertilizer, herbicide and pesticide runoff into the watershed
6. Reduce levels of salinity impacting surface and/or ground water quality, which will decrease levels of dissolved solids
7. Acquire stronger understanding, cooperation and participation regarding water quality issues

Objectives and priority areas have been identified to meet the goals of this plan. NEFCO and the PLTF have identified a series of actions to assist in realizing these objectives. Suggested responsible parties, possible funding sources, estimated time frames, expected improvements, and evaluations for each action have also been assigned. When funding becomes available, work plans will identify which actions will be undertaken as priorities and resources allow. Table 26 contains the action plan developed for the watershed. Appendix R contains a list of abbreviations/acronyms used in the plan.

In addition to the objectives listed in the plan, it was also recommended by Keith Riley (Ohio EPA-NEDO, DSW) that a 201/208 update process be conducted to put a Water Quality Managment Plan in place to protect the watershed by prescribing protective wastewater disposal options for new development in each subwatershed. Also, development of a “cradle to grave” approach was encouraged by Mr. Riley to ensure that HSDSs and SPSDSs do not impact surface water quality. This approach would include installer licensing and testing, inspection of system installation, a long term

operation inspection program, mandatory pumping program, system owner education, countywide septage disposal plans and facility upgrades. These could be facilitated by the Link Deposit and Rural Hardship Grant Program and supported by annual fees to pay for inspections, tracking, watershed surveys, and education programs. The establishment of county-wide septage disposal plans is an essential part of the successful implementation of the above proposed BMPs. Enforcement of Federal 503 Septage Regulations may result in an end to operations by septage land application haulers, making it essential to establish a grid of publicly-owned treatment works (POTWs) with septage receiving capabilities to accept septage generated by each county. The Water Pollution Control Loan Fund (WPCLF) is a feasible funding source for the installation of septage facilities at POTWs.

Table 27 lists specific stream segments for Objective 4.1--protecting or restoring riparian corridors. Table 28 lists specific areas for Objective 4.2--protecting or restoring shorelines of wetlands. These areas were identified using the results of the Riparian Zone Analysis and the Critical Resources Study, in addition to close observation of 1997 orthophotos. Field verification is recommended before planning specific activities in these areas.

Table 27
Stream Segments Identified for Riparian Zone Protection or Restoration Activities in the Upper Tuscarawas River Watershed

*Ranking	Stream Name	Location (by Subwatershed)	Political Jurisdiction	**Location	Additional Considerations
Stream Segments Identified for Protection Efforts					
1	Tuscarawas River	2	Springfield Twp.	Arlington Road to the intersection of Pine Lake Rd. and Shore Side Circle	There are a few segments within this area with low or moderate riparian quality--these segments would benefit from restoration activities.
2	Myersville Creek	4	City of Green	From the confluence to Raber Rd.	This area is particularly important due to the location of the proposed managed area through ODNR--Myersville Fen State Nature Preserve. Also, restoration activities should be targeted along both sides of the gravel pit
3	Wonder Lake Creek	3	City of Green	From East Reservoir to Cottage Grove Rd.	This area has a high quality riparian corridor, which is heavily wooded.
4	Nimisila Creek	5	Jackson Twp.	East and west of Willowdale Lake until Summit/Stark County Line	Residential areas around Willowdale Lake should be targeted for remediation efforts through activities such as education and stormwater control.
Stream Segments Identified for Restoration Efforts					
1	Tuscarawas River	2	Lake Twp.	From the intersection of Pine Lake Rd. and Shore Side Circle to the southwest portion of the watershed (where the headwaters begin)	This portion of the Tuscarawas River is surrounded by residential and commercial areas. Educating riparian landowners about the importance of riparian zone protection would be an appropriate action towards restoration.
2	Myersville Creek	4	City of Green/ Lake Twp.	Stream segment south of Heckman Rd.	Education of riparian landowners would be an important action to assist in restoring this segment.
3	Tributary to Nimisila Creek	5	City of Green	From the Summit/Stark County Line to Greensburg Rd.	Education of riparian landowners would be an appropriate action to assist in restoring this segment.
4	Cottage Grove Creek	3	City of Green	East of Arlington Rd. To Goldenwood	This portion of Cottage Grove Creek has been heavily channelized. Planting grasses, trees and shrubs is needed to restore the riparian vegetation.
5	Cottage Grove Creek	3	City of Green	Stream segment to the east and west of Cottage Grove Rd.	Education of riparian landowners would be an appropriate action to assist in restoring this segment.

*Ranking refers to the order of priority, assigned by NEFCO, for stream protection or restoration efforts
**Many of the roads included for locating stream segments are not labeled on maps presented in this report. Please refer to Summit and Stark County Road Maps when locating stream areas.

Table 28
Areas Identified for Increasing or Protecting Wetlands in the Upper Tuscarawas River Watershed

*Ranking	Location (by Subwatershed)	Political Jurisdiction	**Location	Action Needed	Additional Considerations
1	5	City of Green	Singer Lake Area--just north of Summit/Stark County Line and east of Arlington Rd.	Protection	This is the most biologically significant wetland in the watershed, with 25 unique plant and animal species identified
2	2	Lake Township	On both sides of the Tuscarawas River headwaters	Protection	
3	3	City of Akron/ Coventry Township	Just north of Long Lake	Protection	This wetland most likely serves as a natural element for flood control
4	1	City of Akron	Northwest of Nesmith Lake	Protection	This wetland may help alleviate the effects of storm water entering Nesmith Lake
5	3	City of Green	Between Cottage Grove Rd. and Arlington Rd. on Cottage Grove Creek	Protection	
6	4	City of Green	Just north of baseball fields on Kreighbaum Rd.	Protection	It may not be possible to protect this wetland, since it is being considered for future development.
7	3	City of Green	Former site of Wonder Lake on Wonder Lake Creek, northeast intersection of Cottage Grove Rd. and Moore Rd.	Increase wetlands	This may be a suitable site for constructing a water quantity/water quality sediment and flood control basin.
8	2	Springfield Township	Northeast and west of Kim-Tam Lake	Protection	

*Ranking refers to the order of priority, assigned by NEFCO, for protecting or increasing wetlands
**Many of the roads included for locating wetlands are not labeled on maps presented in this report. Please refer to Summit and Stark County Road Maps when locating wetland areas. Field verification is also recommended for wetland areas identified in this report.

Suggested responsible parties and members of the PLTF received draft copies of the Action Plan during the final stages of the plan's development. They were asked to complete and return a questionnaire regarding the effectiveness of the plan. Appendix T contains the completed questionnaires which were returned to NEFCO.

Recommendations for Future Work

The Watershed Action Plan can be a useful tool for gathering public support and funding for future efforts. Strong partnerships between regulatory agencies, planning organizations, local governments and others with an interest in the watershed is needed to assure success of the plan. As mentioned earlier in this report, previous meetings in the watershed suggested the need for the formation of a management committee with local leaders and agencies as the base. Member organizations on the committee, e.g., OEPA and ODNR, would be given direction regarding important issues to consider when developing projects involving the watershed. The management committee would be the foundation for a working coalition. This coalition would involve multiple stakeholders and would assist with obtaining funding for the plan, as well as promoting and coordinating intercommunty activities. It is important that this coalition is recognized by the public, as well as community leaders, as a group which brings people together to solve water quality issues. NEFCO would facilitate and support the coalition; however, volunteer and grassroots groups would be the best suited to increase community involvement and accomplish the actions.

Continuous monitoring, evaluation and improvement is needed for the Action Plan to keep it up-to-date and strategic. Down the road, as additional information is made available, the relevance of issues may need to be reconsidered, in addition to introducing new issues. It is important to identify any obstacles, which may be encountered with the various actions in the plan, before implementation begins. When deciding on which actions to accomplish first; it would be best to select actions which use minimum resources; yet provide the maximum benefit to the watershed. Therefore; it is strongly recommended that the next phase include an analysis of high priority areas and the cost effectiveness of various actons involved, in addition to a method of evaluating measureable performance standards to track progress. This approach would help attract additional funding and community support for future projects.

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