Ten Mile Creek Watershed Based Plan

HUC 051002053390

11/2/2005

Introduction:

The Ten Mile Creek lies in the northeastern corner of the Kentucky River basin and the Eagle Creek Watershed. According to the Kentucky River Basin Management Plan, this 68 square mile watershed has mixed land use, about 60% agricultural, 30 % rural and wooded, and 10% residential or commercial (Kentucky Water Resources Research Institute 2002). Although much of the Ten Mile Creek watershed (TMCW) was not assessed as of 2000, usage support maps for the 2000 305b Report to Congress show Arnolds Creek in this watershed partially supporting for aquatic life due to siltation (Kentucky Natural Resources and Environmental Protection Cabinet Division of Water 2000).This report also shows the Eagle Creek immediately below the mouth of the Ten Mile Creek to be non-supporting for primary contact recreation. Maps in appendix show Ten Mile Creek watershed, relationship of TMCW to lower Eagle Creek, impairments, land-use, subwatershed delineations and hydrological unit codes.

When this usage designation of non-support for Eagle Creek resulted in a Section 319 (h) Grant for a Total Maximum Daily Load, an in-depth sampling and analysis of bacteriological indicators in this area (including a sampling site in the Ten Mile Creek) showed the Ten Mile Creek often exceeded use support parameters for primary contact recreation (KWRRI 2004). Further, a related and concurrent study of ratios of different types of bacteria provided evidence that the source of the bacteriological impairment was not only agricultural (animal manure), but also human (sewage) (Ormsbee, L.; Brion, G. 2004) According to the KWRRI (2004) TMDL study, the sampling site (T6) on the lower Ten Mile Creek had the "highest geometric mean (for fecal coliform bacteria) of any of the sites for dry days during 2003. This is likely indicative that there continue to be some significant sources on Ten Mile Creek (i.e. straight pipes and failing septic systems) whose identification and removal could lead to potential significant improvement in the downstream water quality."

This Watershed Based Plan is an effort to address these concerns in a way that is most effective for this watershed given the local knowledge, and the experience of local agencies combined with sound science and citizen action. The goal is not to solve these problems immediately, but rather to bring about a comprehensive approach to solving local water quality problems that can be implemented given practical realities unique to the Ten Mile Creek watershed. In doing so in such a way that puts local concerns in the context of the overall concerns of the Kentucky River Basin Management Plan, the Eagle Creek Watershed residents and officials will be taking part in a comprehensive plan to restore and protect the Commonwealth's waters.

Because human waste has been shown to be an important contributing factor to fecal bacterial loads in the Ten Mile Creek, and because of potential public health dangers involving sewage in waters open to the public, it is imperative that addressing this impairment source be the first priority of this Watershed Based Plan. With recent outbreaks of Cryptosporidium and Giardia in Northern Kentucky, the importance of preventing sewage-borne diseases becomes all the more poignant (Northern Kentucky Health Department 2005). It is important, however, that a comprehensive plan to address water quality in the Ten Mile Creek Watershed (TMCW) include efforts to reduce other sources of impairment, such as silt, animal manure, pesticide, and household hazardous waste (see below).

a. Pollution causes

The following have been identified as causes and sources or groups of similar sources that need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan) discussed in the section below. Sources that need to be controlled are identified at subcategory level with estimates of the extent to which they are present in the watershed.

Pathogens

- 8 KPDES permitted package treatment plants in TMCW (2 are spray irrigation). Package treatment plants may not always function properly and may contribute to pathogen load. (KWRRI 2002)
- Leaking municipal sewage pipes: unknown contribution amounts
- Failing septic systems, estimated 45 straightpipes and 158 failing septic systems. (KWRRI 2004)
- Livestock waste runoff from pasture: approximately 4430 animal units in TMCW. (KWRRI 2004)

Sediment

- Construction site runoff estimated 5-10 tons per acre (approx. 30 to 100 houses built per year in TMCW)(Based on the number of septic permits and inspections in Northern Kentucky Health Department Records and KWRRI, 2002 figure for agricultural erosion potential)
- Stream channelization/modification estimated 3000-5000 ft of channelized/eroded bank in TMCW (Unknown amount, estimated by Northern Kentucky Health Department.)
- Crop-associated runoff 5.06 tons per acre, around 8000 acres in cultivation in the TMCW (KWRRI 2002)

Pesticide

- 2004 Kentucky River Watershed Watch found the highest levels of metolachlor and triazine of all tested locations in the KY basin (KWRRI 2005)

Fertilizer

- Ag potential fertilizer loading estimated 322 tons applied in TMCW, unknown amount affecting streams (KWRR1 2002).

Household Hazardous Materials

- Potential for household hazardous waste (used engine oil, antifreeze, old pesticides, etc.) from homeowners (Northern Kentucky Household Hazardous Waste Action Coalition 2005)

b. Load Reductions estimate

An estimate of the load reductions for the pollutants that have been mentioned above are addressed in this section. However, regarding the pollutants which will not be directly addressed in the current project, it is difficult to project a specific load reduction.

Pathogens

- Leaking municipal sewage pipes; unknown how much this could be reduced.
- Septic straight pipes (estimated 45 sources), failing septic systems (estimated 158 sources) (leaking lateral fields, overflows, etc.) could be reduced by installation of 40-100 new or repaired septic systems. Load (cfu/day) could be reduced 90% from 4.21E+12 to 4.21E+11 (KWRRI 2004).
- 8 KPDES permitted package treatment plants in TMCW (2 are spray irrigation).Package treatment plants may not always function properly and may contribute to pathogen load. Extent of this problem is unknown at this time. Unknown how much this could be reduced.
- KPDES violations: 26 in 1999 for 8 KPDES permitted discharge sites. (KWRR) Unknown how much this could be reduced.
- Livestock waste runoff from approximately 4500-7500 cattle in TMCW. Unknown how much this could be reduced.

Sediment

- Construction site runoff estimated 5-10 tons per acre (approx. 30 to 100 houses built per year in TMCW, <200 acres open per year due to new construction). Unknown how much this could be reduced.
- Stream channelization/modification estimated 3000 ft of channelized/eroded bank in TMCW. Unknown how much this could be reduced.
- Crop-associated runoff 5.06 tons per acre. Unknown how much this could be reduced.

Pesticide

- 2004 levels of metolachlor and triazine could be significantly reduced. Unknown how much this could be reduced.

Fertilizer

- Ag potential fertilizer loading estimated 322 tons applied - no data available on amounts reaching TMCW waterways Unknown how much this could be reduced.

c. Load Reduction methods

Descriptions of the non point source management measures that will need to be implemented to achieve the load reductions estimated above as well as achieve other watershed goals identified in this watershed-based plan and the identification of the critical areas in which those measures will needed to implement this plan.

Pathogens (Human sources)

Critical Areas: Scattered throughout the TMCW watershed, early emphasis on highest impact septic problems.

- The Groundwater Protection Plan regulation 401 KAR 5:037, promulgated in 1994 by the Division of Water, requires, among other things, that anyone engaged in activities that have the potential to pollute groundwater must develop and implement a Groundwater Protection Plan. This includes individual residential septic systems. KY Division of Water has developed generic GPP's for homeowner use. Kentucky Natural Resources and Environmental Protection Cabinet Division of Water 2005.
- NKHD Onsite wastewater grant: assist with repairs to restore functional systems through section 319(h) funds.
- Continue county ordinance requiring final septic inspection before electricity can be connected
- Continue Grant County Building Inspection practice of requiring Health Department approval of septic system before building permits may be issued for home additions.
- Conduct public education regarding septic system maintenance, illegality of straight pipes, transfer of property, building additions, new home sites, etc.
- Identify straight pipe locations; where possible, replace with septic systems or sewer connections.
- Identify old, leaking sewage lines; make necessary repairs.
- Where possible, create regional sewer systems.
- Coordinate enforcement between KYDOW and NKHD.
- KYDOW follow-up on KPDES violations, especially on repeat offenders.

Pathogens (Agricultural sources)

Critical Areas: Farmland adjacent to streams in the TMCW

- The1994 Kentucky Agriculture Water Quality Act (KRS. 224.71-100 through 224.71-140) requires all landowner/land users with ten (10) or more acres that is being used for agriculture or silviculture operations to develop and implement a water quality plan based upon guidance from the Kentucky Agriculture Water Quality Plan. Kentucky Division of Conservation 2005.
- Maintain adequate riparian buffer zones along creeks.
- Minimize livestock access to creek.
- Minimize land application of manure.
- Encourage farm operators to employ Best Management Practices (BMP's) and implement certified watershed plans
- Recognize farmers/operators who successfully employ BMP's.
- Farm field days to demonstrate BMP's

Sediment

Critical Areas: New subdivisions and active cropland, logging operations within the TMCW

- Public education to encourage area builders and equipment operators to attend BMP training and review Kentucky Erosion Prevention Field Guide for correct installation of BMP's.
- Recognize builders who successfully employ BMP's.
- Increase funding for better enforcement of existing Zoning ordinance for construction-site sediment control. Grant County Planning and Zoning 2005.
- Discourage stream channelization/modification activities, which alter the natural stream course and increase streambank erosion.
- Encourage use of Kentucky Transportation Cabinet's Stream Mitigation Bank Initiative to repair damaged streams and streambanks.
- Maintain vegetated riparian zones.
- Encourage no-till farming, cover crops, etc.
- Although logging is a very minor component of TMCW land use, the Kentucky Forest Conservation Act, KRS 149.330 to 149.355 requires loggers to employ BMP's throughout their logging operations and encourages landowners to use these BMP's if their own private logging can result in erosion potential. Kentucky Division of Forestry 2005.

Pesticides

Critical Areas: Residential areas, farms

- Higher than average levels of metolachlor and triazine could be significantly reduced through education and outreach regarding timing weather conditions and methods of application.
- Non-regulated applicator education regarding proper handling and application could be conducted at the point of sale via signage and/or brochures.
- Education about Department of Agriculture's Unwanted Pesticides Collection and Disposal Program and their Rinse and Return programs can reduce and prevent harmful pesticide levels in streams.

Fertilizer

Critical areas: Farms

- Ag potential fertilizer loading could be addressed through Ag Water Quality Plan implementation through the Natural Resources Conservation Service and the Grant County Conservation District.

Household Hazardous Materials

Critical Areas: Residences in the watershed

- Public education about Northern Kentucky Household Hazardous Waste Action Coalition's efforts to provide citizens with safe disposal methods for the most common household hazardous wastes and Kentucky Department of Agriculture pesticide reduction efforts, as well as free use of landfill for waste collection customers/residents.
- A "waste exchange" program (where one resident drops off, for example, a can of useable white paint, and another resident comes in looking for a can of white paint, thus keeping it out of the landfill) could be established.

d. Money needed

The limited amount of information available prevents an accurate estimate of the amount of money needed to correct problems addressed in this WBP. However, the following is a list of potential sources of funding as relates to problems addressed, as well as an informal assessment of technical needs.

319 Nonpoint Source Grant

- Training for managing construction-related erosion
- Additional upgrades to septic systems, straight pipe replacements
- Broad community education on nonpoint source pollution impacts and ways to reduce it

Clean Water State Revolving Fund

- Sewer line installation and repairs
- Wastewater treatment plant upgrades

USDA Rural Development Rural Housing Repair and Rehabilitation Grants and Loans

- This program can be utilized by low income or elderly homeowners to address wastewater problems.

USDA Farm Bill Programs (EQIP, CRP)

- Creation or enhancement of riparian buffer zones
- Livestock exclusion fencing along streams
- Remote water sources for livestock

Kentucky Soil Erosion and Water Quality Cost Share Program Kentucky Soil Stewardship Program - Phase I TSA

- Cost share monies available for assistance in implementing Ag Water Quality Plans

Technical Needs

- Funding and staff to enforce existing Onsite Wastewater regulations
- Funding and staff to enforce existing surface water quality regulations
- Funding and staff to enforce existing sediment and subdivision ordinances.

e. Educational component

Several state and local agencies and groups are active in promoting practices that encourage clean water and have education and outreach programs geared toward improving and preserving water quality. The Grant County Conservation District and the Natural Resources Conservation Service, Grant County Solid Waste 109 Board, UK Cooperative Extension Service and the Department of Agriculture, Kentucky Department of Fish and Wildlife Resources, UK Kentucky Water Resource Research Institute, Kentucky Environmental and Public Protection Cabinet's Division of Water, and the Northern Kentucky Health Department (NKHD) all have programs that in one way or another relate to water quality. Several citizen groups are active in water quality issues, such as Kentucky River Watershed Watch, the Eagle Creek Watershed Council, and the Kentucky Waterways Alliance.

Through a combination of knowledge, positive and supportive interaction and awareness, these groups could greatly increase their effectiveness in getting out their respective messages, while reducing duplication of efforts. For instance, several of the above-mentioned groups already have participated in the creation and development of the Northern Kentucky Household Hazardous Waste Action Coalition (NKHHWAC), which is a coordinated effort among the four northern Kentucky Counties of Boone, Campbell, Grant, and Kenton to present a unified and informative approach to household hazardous waste. The NKHHWAC website can be found at http://www.nkyhealth.org/nkyhdhw/hw.dll?page&file=hhwoverview.

In order to coordinate education and outreach efforts, a roundtable discussion of the various groups and agencies could be very helpful. The strengths, areas of authority, the enforcement abilities, the educational resources, available through each could be made available to all, and communication between groups could be improved by increased exposure and understanding of the roles of each.

The Ten Mile Creek Watershed Plan will be disseminated through the Northern Kentucky Health Department Website, www.nkyhealth .org, the Eagle Creek Watershed Council website at http://www.kwalliance.org/WCeaglecreek/index.html and the Commonwealth Comprehensive Water Education Plan Website. The CCWEP website may contain links to the Eagle Creek Watershed Council Website with information about the Ten Mile Creek Watershed Based Plan, KRISTEN DUNAWAY KSDUNAWAY@hotmail.com email her (info for ccwep website) could request PSA'a for the radio station also, also have TV spots, 6 altogether.

f. Implementation Schedule

See Implementation Schedule Chart appendix B.

Pathogens (Human sources)

- Onsite wastewater grant: assist with repairs to restore functional systems through section 319(h) funds
- Continue county ordinance requiring final septic inspection before electricity can be connected
- Continue Building inspection practice of requiring Health Department approval of septic system before building permits may be issued for home additions
- Conduct public education regarding septic system maintenance, illegality of straight pipes, transfer of property, building additions, new home sites, etc.
- Identify straight pipe locations; where possible, replace with septic systems or sewer connections
- Identify old, leaking sewage lines; make necessary repairs
- Where possible, create regional sewer systems
- Coordinate enforcement between DOW and NKHD
- Use social marketing to target and refine message

Pathogens (Agricultural sources)

- Maintain adequate riparian buffer zones along creeks
- Minimize livestock access to creek
- Minimize land application of manure
- Encourage farm operators to employ Best Management Practices (BMP) and review and implement certified watershed plans
- Recognize farmers/operators who successfully employ BMP's

Sediment

- Public education to encourage area builders and equipment operators to attend BMP training and review Kentucky Erosion Prevention Field Guide for correct installation of BMP's.
- Recognize builders who successfully employ BMP's
- Increase funding for better enforcement of existing ordinance for construction-site sediment control
- Discourage stream channelization/modification activities, which alter the natural stream course and increase streambank erosion
- Maintain vegetated riparian zones
- Encourage no-till farming, cover crops, etc.
- Farm field days to demonstrate BMP's

Pesticides

- Higher than average levels of metolachlor and triazine could be significantly reduced through education and outreach regarding timing weather conditions and methods of application
- Non-regulated applicator education regarding proper handling and application could be conducted at the point of sale via signage and/or brochures.
- Education about Department of Agriculture's Unwanted Pesticides Collection and Disposal Program and their Rinse and Return programs can reduce and prevent harmful pesticide levels in streams

Fertilizer

- Ag potential fertilizer loading could be addressed through ag water quality plan implementation

Household Hazardous Materials

- Educate about NKHHWAC and Department of Agriculture's Unwanted Pesticides Collection and Disposal Program and their Rinse and Return programs, free use of landfill for waste collection customers/residents
- A "waste exchange" program (where one resident drops off, for example, a can of useable white paint, and another resident comes in looking for a can of white paint, thus keeping it out of the landfill) could be established.

g. Milestones

	Milestone	Person or group who will accomplish this task	Expected Begin Date	Expected End Date
	Pathogens (Human sources)			
1.	Onsite wastewater grant: assist with repairs to restore functional systems through section 319(h) funds	Northern Kentucky Health Department	11/15/05	12/31/2007
2.	Continue county ordinance requiring final septic inspection before electricity can be connected.	Owen Electric Cooperative	11/15/05	Unknown
3.	Continue Building inspection practice of requiring Health Department approval of septic system before building permits may be issued for home additions.	Grant County Building Inspector	11/15/05	Unknown
4.	Conduct public education regarding septic system maintenance, illegality of straight pipes, transfer of property, building additions, new home sites, etc.	NKHD, Eagle Creek Watershed Council	11/15/05	12/31/2012
5.	Identify straight pipe locations; where possible, replace with septic systems or sewer connections	NKHD	11/15/05	Unknown
6.	Identify old, leaking sewage lines; make necessary repairs	Grant County Sewer District	11/15/05	Unknown
7.	Where possible, create regional sewer systems.	Grant County Sewer District	11/15/05	Unknown
8.	Coordinate enforcement between DOW and NKHD	DOW and NKHD	11/15/05	Unknown

9. Use social marketing to target and refine message	NKHD	11/15/05	Unknown
10. Encourage homeowners to use Generic Groundwater Protection Plans	NKHD, DOW, NRCS, ECWC	11/15/05	Unknown
Pathogens (Agricultural sources)		11/15/05	
11. Encourage implementation Kentucky Agriculture Water Quality Plan and cost share resources for croplands	NKHD, NRCS	11/15/05	Unknown
10. Maintain adequate riparian buffer zones along creeks	NRCS	11/15/05	Unknown
11. Minimize livestock access to creek	NRCS	11/15/05	Unknown
12. Minimize land application of manure	NRCS	11/15/05	Unknown
13. Encourage farm operators to employ Best Management Practices (BMP) and review and implement certified watershed plans	NRCS	11/15/05	Unknown
14. Farm field days to demonstrate BMP's	NRCS	11/15/05	Unknown
15. Recognize farmers/operators who successfully employ BMP's	NRCS, NKHD, ECWC	11/15/05	Unknown
Sediment		11/15/05	
16. Encourage implementation Kentucky Agriculture Water Quality Plan and cost share resources for logging	NRCS, ECWC	11/15/05	Unknown
17. Public education to encourage area builders and equipment operators to attend BMP training and review Kentucky Erosion Prevention Field Guide for correct installation of BMP's.	NRCS	11/15/05	12/31/2012
18. Recognize builders who successfully employ BMP's	NRCS, NKHD, ECWC	11/15/05	12/31/2012
19. Increase funding for better enforcement of existing ordinance for construction-site sediment control	Grant County Fiscal Court	11/15/05	Unknown
20. Discourage stream channelization/modification activities.	NRCS, NKHD, ECWC, DOW	11/15/05	Unknown
21. Encourage maintaining vegetated riparian zones	NRCS, NKHD, ECWC	11/15/05	Unknown
Pesticides			
22. Non-regulated applicator education regarding proper handling/ application could be conducted at the point of sale via signage and/or brochures.	NRCS	11/15/05	Unknown
23. Higher than average levels of metolachlor and triazine could be significantly reduced through education and outreach regarding timing weather conditions and methods of application	NRCS, NKHD, ECWC	11/15/05	Unknown
24. Education about Department of Agriculture's Unwanted Pesticides Collection and Disposal Program and their Rinse and Return programs can reduce and prevent harmful pesticide levels in streams	NRCS, NKHD, ECWC	11/15/05	Unknown
Fertilizer		11/15/05	
25. Ag potential fertilizer loading could be addressed through ag water quality plan implementation	NRCS, NKHD, ECWC	11/15/05	Unknown
Household Hazardous Materials		11/15/05	
26. A "waste exchange" program (where one resident drops off, for example, a can of useable white paint, and another resident comes in looking for a can of white paint, thus keeping it out of the landfill) could be established.			Unknown
27. Educate about Northern Kentucky Household Hazardous Waste Action Coalition and Department of Agriculture pesticide reduction efforts, free use of landfill for waste collection customers/residents	NKHD	11/15/05	12/31/2012

h. Attainment criteria

Set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised.

Pathogens (Human sources): Reductions in bacteriological indicator levels in the Ten Mile watershed consistent with primary recreation standards

Pathogens (Agricultural sources): Ten percent increase in percentage of farmer/landowner participation in local soil and water quality conservation programs in 5 years

Sediment: Reductions in turbidity levels to average of less than 22 ntu

Pesticides: Reductions in detectable levels of pesticides to non-detectable levels

Fertilizer: No overall increase in stream nutrient levels attributable to fertilizer misapplication

i. WBP monitoring plan

A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

Pathogens (Human sources): Bacteriological indicator levels in the Ten Mile watershed will be monitored as a part of the NKHD's 2005 391(h) grant during the seasons of 2005, 2006, 2007, 2008, and 2009. The final report will contain detailed analysis of water quality trends for five test sites in the watershed. This watershed will likely be monitored near the mouth during the third Kentucky River Basin Management Frame work cycle by KYDOW personnel during the season of 2007. This watershed could also be monitored by Kentucky River Watershed Watch Volunteers, Eagle Creek Watershed Council members, and school groups from the immediate area.

Pathogens (Agricultural sources): Percentages of farmer/landowner participation in local soil and water quality conservation programs can be monitored through the records of the Grant County Conservation District, The Natural Resource Conservation Service, and the UK Cooperative Extension Service.

Sediment: Turbidity levels will be monitored as a part of the Northern Kentucky Health Department's 2005 391(h) grant during the seasons of 2005, 2006, 2007, 2008, and 2009. The final report will contain detailed analysis of water quality trends for five test sites in the watershed. Turbidity levels could also be monitored as a part of the Management Framework sampling during 2007. There is a danger of increased sedimentation levels if the result of building regional sewers is an increase in developments in the TMCW.

Pesticides: The only known group currently monitoring detectable levels of pesticides is Kentucky River Watershed Watch.

Household Hazardous Materials: Participation in HHWAC usage, usage of free dumping as provided to residents can be monitored through the records of the HHWAC and Epperson Landfill.

Fertilizer: Nutrient levels attributable to fertilizer misapplication could be monitored through KY Division of water personnel.

REFERENCES

Grant County, Kentucky Planning and Zoning Commission. Zoning Ordinance for Unincorporated Grant County, City of Crittenden and City of Corinth. September 8, 2005. http://grantcounty.ky.gov/gcpc/publications/. Accessed September 8, 2005.

Kentucky Division of Conservation September 8, 2005 Understanding the Agriculture Water Quality Act and the Planning Process webpage. http://www.conservation.ky.gov/programs/kawqa/. Accessed September 8, 2005

Kentucky Division of Forestry, The Kentucky Forest Conservation Act webpage. September 8, 2005 http://www.forestry.ky.gov/programs/masterlogger/The+Kentucky+Forest+Conservation+Act.htm .Accessed September 8, 2005.

Kentucky Environmental and Public Protection Cabinet and Tetra Tech. Kentucky Erosion Prevention and Sediment Control Field Guide. Frankfort, KY 2004.

Kentucky Natural Resources and Environmental Protection Cabinet Division of Water. Groundwater Protection webpage. September 8, 2005. http://www.water.ky.gov/gw/gwprotection/ Accessed September 8, 2005.

Kentucky Natural Resources and Environmental Protection Cabinet Division of Water. 2000 305b Report to Congress. Frankfort, Kentucky. 2000.

Kentucky Water Resources Research Institute. Kentucky River Basin Management Plan. Lexington, Kentucky: Tracy Farmer Environmental Center. 2002. [http://www.uky.edu/WaterResources/Watershed/KRBMP/MPeaglm.htm]

Kentucky Water Resources Research Institute. Ten Mile Creek Assessment Report. Lexington, Kentucky: Tracy Farmer Environmental Center. 2002. [http://www.uky.edu/WaterResources/Watershed/KRB_AR/PDF_Files/Prints/P_5390.PDF]

Kentucky Water Resources Research Institute. Summary Report: 2004 Kentucky River Watershed Watch Data Collection Effort. Lexington, Kentucky: Tracy Farmer Environmental Center. 2005. [http://www.uky.edu/OtherOrgs/KRWW/AnnualReport04.htm]

Kentucky Water Resources Research Institute. Total Maximum Daily Load Development: Pathogens (Fecal Coliform) for Eagle Creek. Lexington, Kentucky: Tracy Farmer Environmental Center. 2004.

Northern Kentucky Health Department. September 1 2005 . Cryptosporidiosis Health Topics Page. [http://www.nkyhealth.org/nkyhdhw/hw.dll?page&file=crypto]. Accessed September 1 2005 .

Northern Kentucky Household Hazardous Waste Action Coalition Website: [http://www.nkyhealth.org/nkyhdhw/hw.dll?page&file=hhwoverview]

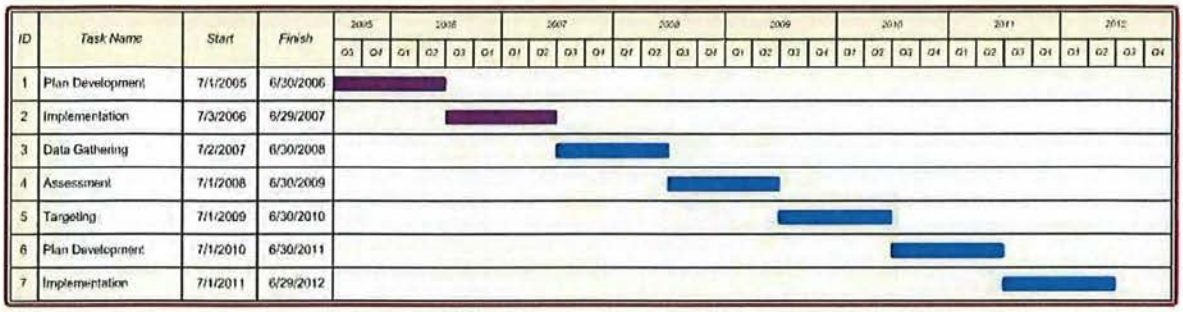
Ormsbee, L. ; Brion, G. Quality Assurance Project Plan for Diagnostic Watershed Model for Pathogen Speciation and Mitigation. Lexington, Kentucky: Tracy Farmer Environmental Center. 2002.

United States Environmental Protection Agency. Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003. 2003. Washington D.C.: United States Environmental Protection Agency. [http://www.epa.gov/owow/nps/Section319/319guide03.html]

APPENDIX

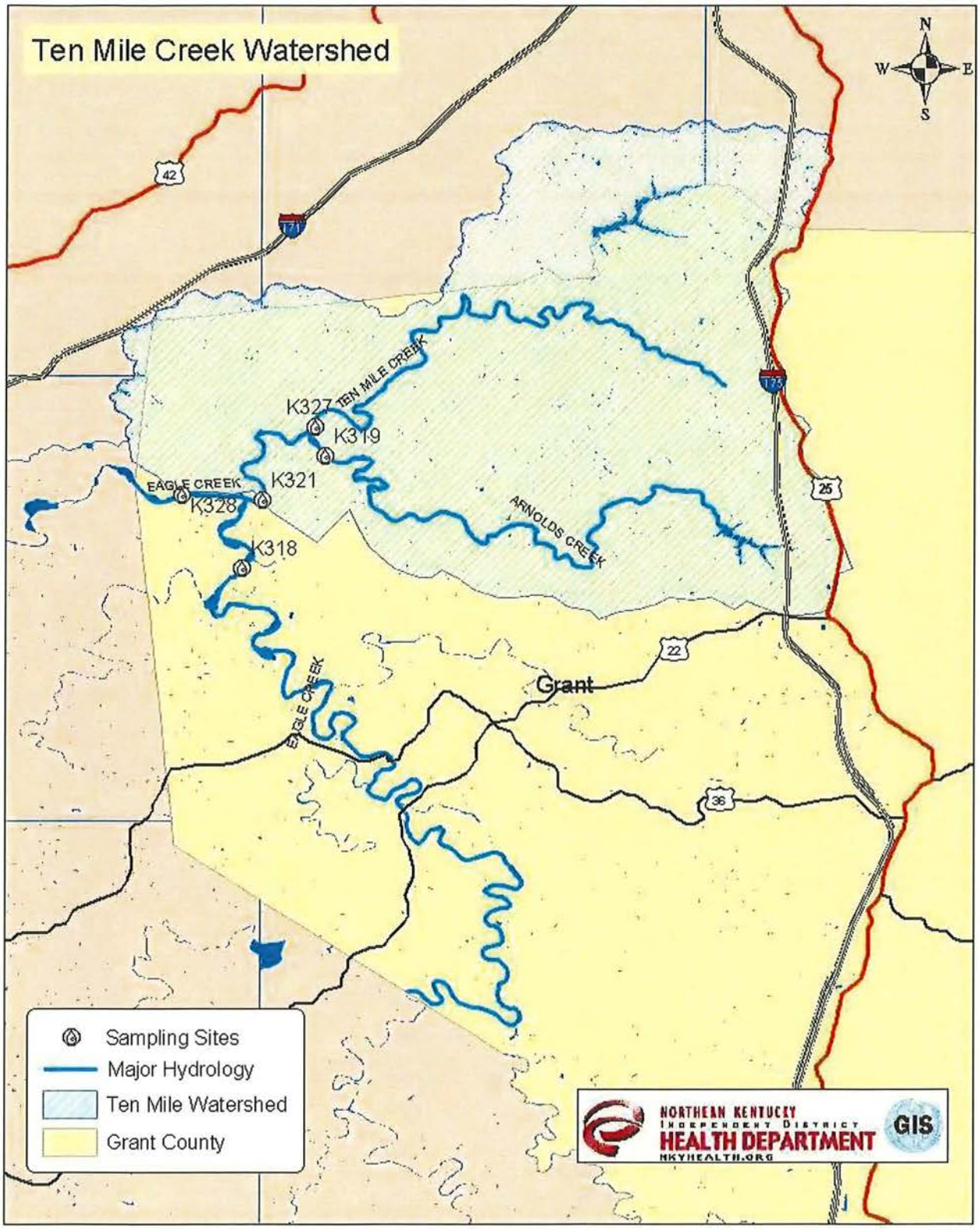
Kentucky River Basin Management Framework Cycles 2 and 3

ID	Task Name	Start	Finish
1	Plan Development	7/1/2005	6/30/2006
2	Implementation	7/3/2006	6/29/2007
3	Data Gathering	7/2/2007	6/30/2008
4	Assessment	7/1/2008	6/30/2009
5	Targeting	7/1/2009	6/30/2010
6	Plan Development	7/1/2010	6/30/2011
7	Implementation	7/1/2011	6/29/2012



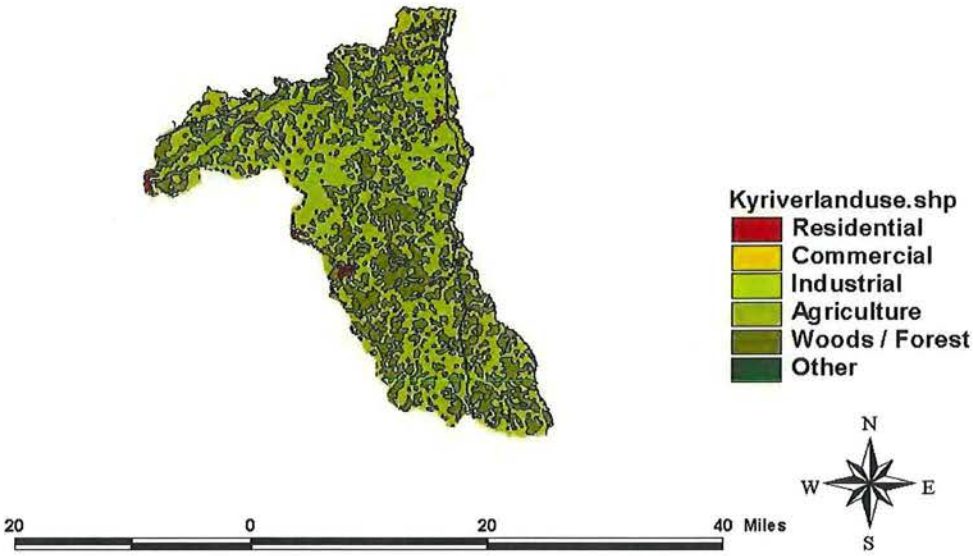
Ten Mile Creek Watershed Based Plan Implementation Schedule

ID	Task Name	Start	Finish
1	PATHOGENS (human)	10/3/2005	10/3/2005
2	NKHD 319 Onsite Incentive grant	10/3/2005	12/31/2008
3	Local ordinance requiring septic final approval for electricity	10/3/2005	12/31/2012
4	Septic approval before building addition permits	10/3/2005	12/31/2012
5	Social Marketing for public education programs	10/3/2005	11/2/2005
6	Public education: septic system maintenance, straight pipes, transfer of property, building additions, new homes	11/3/2005	12/31/2012
7	ID, replace old leaking sewage lines	10/3/2005	12/31/2012
8	Create regional sewers	10/3/2005	12/31/2012
9	Coordinate enforcement efforts between DOW and HD	10/3/2005	12/31/2012
10	PATHOGENS (ag)	10/3/2005	10/3/2005
11	Recognize farmers/ operators w/ good BMP implementation	10/3/2005	12/31/2012
12	Review and implement certified watershed plans	10/3/2005	12/31/2012
13	Actively promote BMP implementation	10/3/2005	12/31/2012
14	PESTICIDES	10/3/2005	10/3/2005
15	Public Ed re proper application of pesticides	10/3/2005	12/31/2012
16	P. Ed re proper disposal of pesticides/ containers	10/3/2005	12/31/2012
17	FERTILIZERS	10/3/2005	10/3/2005
18	P. Ed. Fertilizer appl. and ag WQ plans	10/3/2005	12/31/2012
19	CONTAMINATION	10/3/2005	10/3/2005
20	P. Ed. Household Hazardous Waste Action Coalition, free landfill use for residents	10/3/2005	12/31/2012
21	SEDIMENT	10/3/2005	10/3/2005
22	Encourage area builders and equipment operators to attend Best Management Practices (BMP) training and review guidance manual for correct installation of BMPs	10/3/2005	12/31/2012
23	Recognize builders who successfully employ BMP's	10/3/2005	12/31/2012
24	Increase funding for better enforcement of existing ordinance for construction site sediment control	10/3/2005	12/31/2012
25	Discourage stream channelization/ modification activities	10/3/2005	12/31/2012
26	Encourage no-till farming, cover crops, vegetated riparian zones, etc.	10/3/2005	12/31/2012



FFY 2005 Project Application full app 23
Eagle Creek/NKIDHD

Landuse Map for Eagle Creek Watershed



Eagle Creek Subwatershed delineation

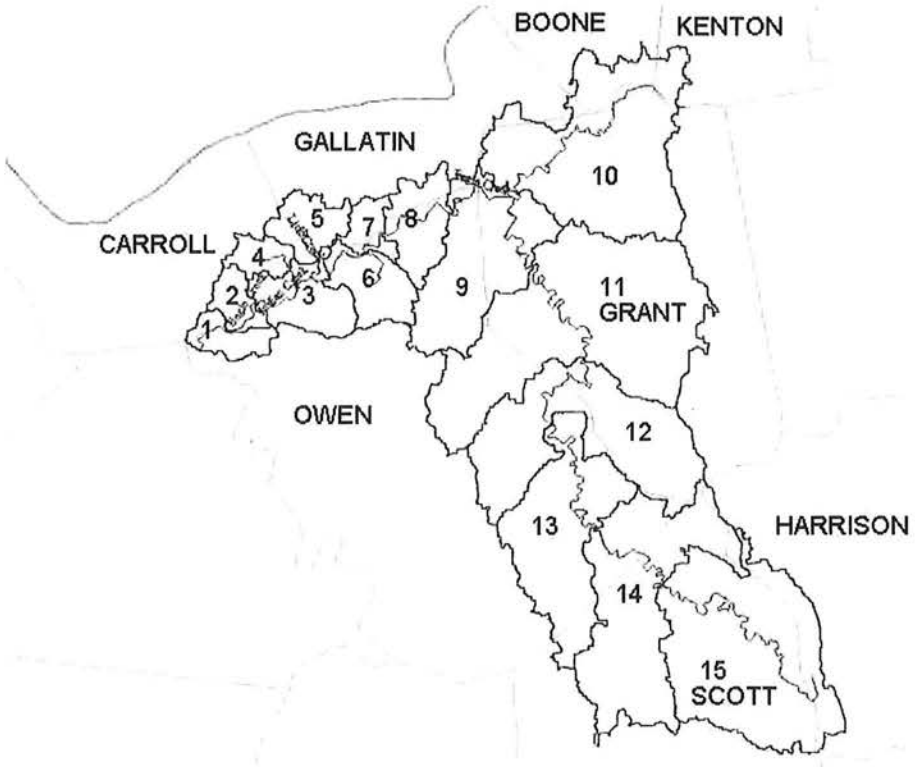
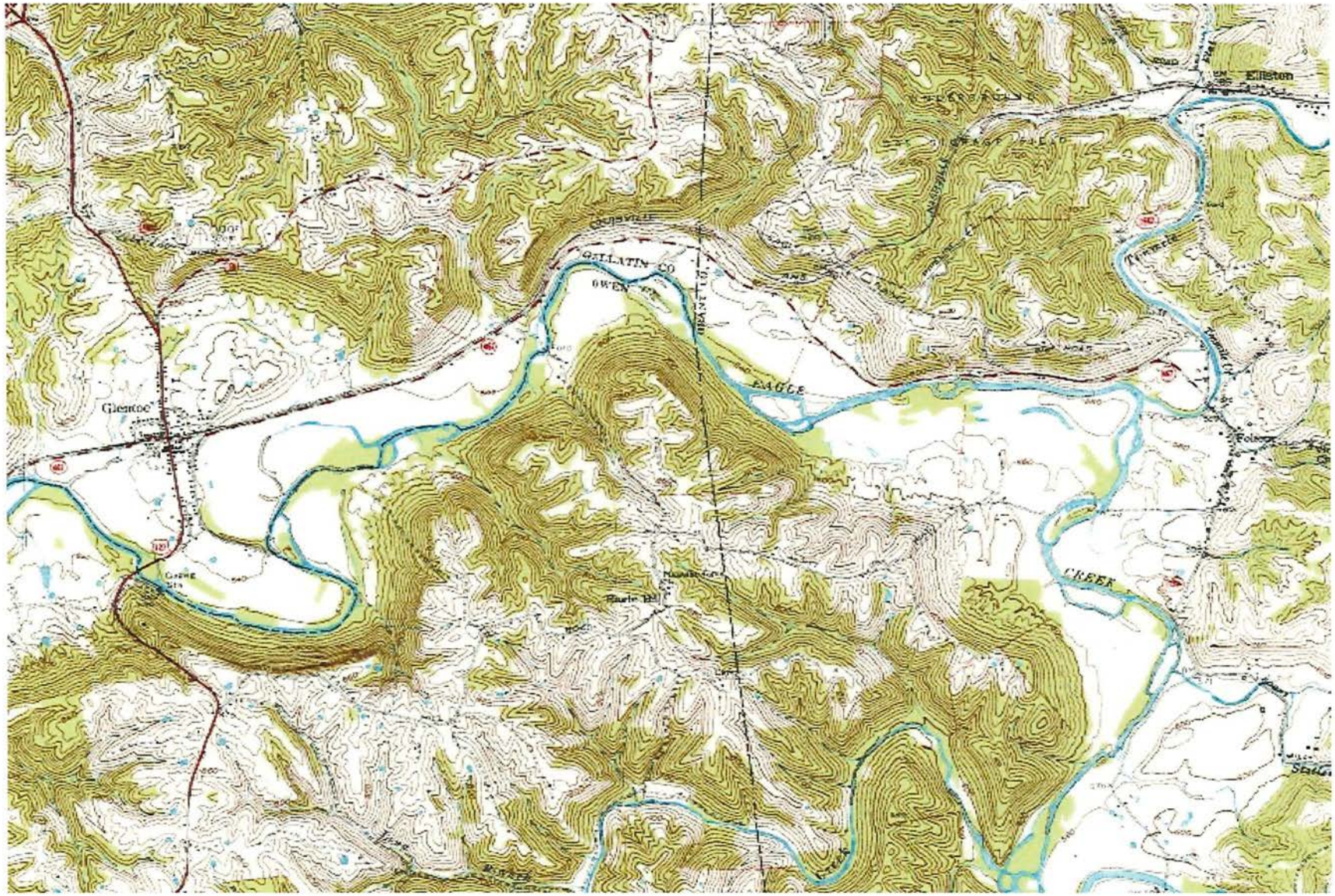


Table 1.1 Land Use in Acres in Eagle Creek Watershed

Subwatershed Number	Sampling Site	Urban (acres)	Forest (acres)	Agriculture (acres)	Total (acres)
1	S1	474	2272	2011	4757
2	T1	162	2083	2062	4307
3	S2	456	4184	5877	10517
4	T2	296	1122	2531	3949
5	T3	354	1621	4989	6964
6	S3	422	3006	5850	9278
7	T4	430	1323	2334	4087
8	S4	566	3395	5904	9865
9	S5	1066	8504	18345	27915
10	T6	5048	13001	29690	47739
11	S6	3844	16092	42048	61984
12	S6	2032	15812	19275	37119
13	S6	380	18748	11641	30769
14	S6	1114	13532	24425	39071
15	S6	1430	23370	25467	50267
Total Area (acres)		**18074**	**128065**	**202449**	**348588**

Relationship of Ten Mile Creek Mouth to Lower Eagle Creek



Hydrological unit codes for watersheds in Grant County, Kentucky

Hydrological unit codes for watersheds in Owen County, Kentucky