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## Executive Summary

The overall goal of the Fleming Creek Clean Water Action Plan was to reduce non-point source pollution in the Fleming Creek Watershed and improve the bacterial and biological integrity of the streams within the project area. The primary focus of this project was and is to restore and remove the impaired use designation of streams within the Fleming Creek watershed. This is being accomplished by implementing demonstration Best Management Practices (BMPs) on agricultural operations and implementing the whole-farm planning process in two sub-watersheds within the Fleming Creek watershed. Water quality issues addressed in this project were bacteria, nutrients, and sediment, as well as other pollutants from non-point sources including livestock operations and cropland. The whole-farm planning process was used to identify and evaluate the implementation of agricultural BMPs that when fully implemented will permit sustained use of the natural resources and meet specific quality criteria. BMPs installed with cost-share assistance through this project included livestock exclusion fencing, rotational grazing establishment, including pasture division fencing, alternative livestock watering facilities, and pasture and hayland seeding for improved forage quality, stream crossings, critical area plantings, heavy use areas, stream crossings, and grassed waterways. During the on-farm planning phase all resource concerns were addressed to reduce the maximum amount of non-point source pollution as possible from entering Fleming Creek and tributaries.

To assess the improvement of stream health within the Fleming Creek watershed bacteriological and biological monitoring were conducted in 2006 and 2007 by Redwing Ecological, an independent contractor. After collected data was compiled and analyzed it was determined there was a trend toward water quality improvement as compared to the Fleming Creek Watershed Non-Point Source Demonstration Project – Final Report May 2000 on a majority of the sample sites.

A project oversight committee facilitated, directed, reviewed and approved progress of the project as it was implemented. The Oversight committee consisted of representatives from local, state, and national organizations.

Through educational outreach cooperators and landusers were introduced to proven technologies that produced sustaining economic viability while improving water quality within their watershed. Technology demonstrations of implemented BMPs were presented to producers at field days and public meetings in the area to encourage implementation and adoption of the practices displayed, while showcasing the needed operation and maintenance required to fully gain the benefits of the installed BMPs.

## **Introduction & Background**

The overall goal of the Fleming Creek Clean Water Action Plan (CWAP) is to reduce nonpoint source pollution in Kentucky's waterways and improve the biological and chemical integrity of streams within the Fleming Creek project area. The Fleming Creek Watershed is contained almost entirely within Fleming County, which is located in northeastern Kentucky. Drainage from Fleming Creek generally flows east to west and enters the Licking River in northeastern Nicholas County. Fleming Creek's mainstem is 39 miles long, draining 61,670 acres. The Fleming Creek Hydrologic Unit Code (HUC) is 05100101200. Four wastewater related KPDES permits are active in the watershed: Flemingsburg Sewage Treatment Plant, Fleming County Board of Education, Housing Innovations, Inc. and Paradise Properties LLC. Implementation of BMPs on agricultural operations and implementing the whole-farm planning process addressed the resource concerns applicable to water quality within the Fleming Creek project area. Application and installation of appropriate conservation practices were expected to reduce the nonpoint source pollution from agricultural operations.

Fleming Creek is impaired by pathogens (bacteria), nutrients, and organic enrichment/low dissolved oxygen. A Total Maximum Daily Load (TMDL) for pathogens has been developed and approved by the Environmental Protection Agency (EPA). (KDOW 2000). Water quality issues that were addressed in the Fleming Creek Project area include bacteria, nutrients, solids transported via runoff (organic matter, nutrient-laden sediments), and other pollutants from non-point sources including livestock operations and cropland. Bacteria was the primary water quality parameter to be addressed through the implementation of the Fleming Creek Clean Water Action Plan. Dairy and beef cattle operations comprise the majority of agricultural livestock operations within the watershed. The project area is located entirely in Fleming County.

The Kentucky Division of Water (KDOW) has been gathering physiochemical, bacteriological, and biological data to establish water quality conditions in the Fleming Creek watershed. KDOW efforts began in 1992 and continued semi-annually. Bacterial results indicated high fecal coliform and fecal counts, with fecal coliform levels exceeding six times the state criteria for primary contact recreation on two small tributaries in the watershed (KDOW, 1994). Fleming Creek had a Total Maximum Daily Load (TMDL) developed and published in April 2001.

Water quality findings published in the March 1996 "Fleming Creek Demonstration Project: Pre-BMP Report" by the KDOW indicate that water quality is somewhat degraded within the study area. Several stream reaches have been listed as use impaired (KDOW, 1994). Within the watershed 75.2 stream miles do not support the Designated Use of Primary Contact Recreation (PCR) due to high pathogen levels and 53.7 stream miles do not support the Designated Use of Warmwater Aquatic Habitat (WAH or Aquatic Life) because of nutrients, organic enrichment, low dissolved oxygen and noxious aquatic plants (KDOW 2006).

## Materials and Methods

The Kentucky Division of Conservation served as the lead agency for this project, administering the project. Other cooperating agencies and entities were: USDA-NRCS, KDOW, Fleming County Conservation District, Kentucky Farm Bureau, and University of Kentucky Cooperative Extension Services.

Bacteria was the primary parameter targeted for improvement of water quality. Bacteriological sampling was conducted to document changes in water quality. Biological monitoring assessment, specifically macroinvertebrate data, was also conducted in the Fleming Creek watershed during this project. KDOW conducted previous biological assessment in the Fleming Creek Watershed. Sampling site location, timing, and assessment protocols were determined by KDOW and are outlined in the approved QA/QC plan for this project (Appendix B). Grab samples for fecal coliform monitoring and flow data were collected on the second Wednesday of each month during the primary contact recreation season (May – October) at each of 28 sites throughout the watershed. These samples were transported to Morehead State University's water testing lab for analysis. Redwing Ecological Services provided interpretation of the collected data.

The primary focus of the Fleming Creek CWAP was to restore the 303d listed streams to state water quality standards. Accomplishing this for the use impaired streams listed above required whole-farm planning. BMPs that addressed resource concerns of the landuser, watershed concerns and specifically impacted water quality were implemented initially in two sub-watersheds of the Fleming Creek watershed. Initial BMP implementation occurred in spring of 2002 under a '99 contract with EPA and has continued under the 2000 MOA contract with two additional sub-watersheds also being targeted. The first two sub-watersheds that were targeted showed very high fecal amounts according the Fleming Creek TMDL (KDOW, 2001). The Fleming Creek Oversight Committee realized early in the implementation phase of the project the financial constraints of implementing the whole-farm planning process in the entire watershed, they then made the decision based on the TMDL to target Allison Creek and Wilson Run sub-watersheds for BMP implementation under the first CWAP project. The two additional sub-watersheds that were added are Cassidy Creek and Flat Run. These watersheds were targeted for BMP implementation after examining the water quality data collected by Redwing Ecological Services, Inc. The available data for Cassidy Creek indicate no improvement in water quality since the beginning of the project and has never met water quality standards for fecal coliforms. Flat Run water quality data indicates a decrease in water quality with an increase in fecal coliforms.

BMP implementation began in the spring of 2002 with nine farms in the Wilson Run and Allison Creek watersheds being approved for cost-share assistance during the first ranking period. During the second ranking period 9 additional farms in the Cassidy Creek and Flat Run were approved for BMP implementation. A ranking worksheet (Appendix D) was developed to determine eligibility for the CWAP cost-share program. Cost-share assistance was provided for BMPs that improved water quality and were

included in the BMP Implementation Plan (Appendix C). CWAP was used to subsidize existing cost-share programs such as the Conservation Reserve Program (CRP), Environmental Quality Improvement Program (EQIP), and Kentucky's state cost-share program. Cost-share assistance was provided only to the producers that agreed to exclude livestock from all blue-line streams on their farm. Other BMPs eligible for cost share assistance were: alternative watering systems, including pipeline and tanks installed from municipal water sources or existing ponds, pond construction and spring development; internal fencing for rotational grazing development; grassed waterways; critical area plantings; pasture or hayland seeding; stream crossings; and heavy use areas. All BMPs installed were required to meet NRCS Standards and Specifications as outlined in the Field Office Technical Guide. Before implementation of BMP's could begin all approved landowners' were required to read and sign the Fleming Creek Clean Water Action Plan Standards and Specifications for Best Management Practice Installation, the Fleming Creek Clean Water Action Plan (CWAP) Administrative Regulations, and the Operation & Maintenance Agreement (Appendix D).

## **Results & Discussion**

### **BMP Implementation**

The Fleming Creek CWAP project has installed cost-shared BMPs on 4 farms in the Wilson Run watershed, 5 farms in the Allison Creek watershed and 2 farms in the Cassidy Creek watershed. Additionally 3 other farms in the Cassidy Creek watershed and 4 in the Flat Run watershed have been approved for funding, but due to extreme drought conditions this summer have not been able to implement the approved BMPs. Livestock exclusion fence was installed on all blue-line streams on these farms to exclude livestock from the streams, a total of 44,557 feet of fence were installed during this project, and 34,378 feet of internal fencing was installed to implement rotational grazing systems. Critical area plantings were established to reduce sediment laden run-off from entering waterways on actively eroding land, 8.1 acres of critical area plantings were addressed during this project. A total of 18,795 square feet of heavy use area consisting of filter fabric and rock were installed to eliminate massive erosion from animal feeding areas. Five ponds were constructed, 4 springs developed and 23 livestock watering tanks installed with 9,388 feet of permanently installed water pipeline during this project to allow adequate water distribution for rotational grazing systems, after the cattle were excluded from the streams. A total of 766.5 acres of pasture or hayland was also seeded to a grass legume mixture after eradicating the previously established fescue. This was done to improve forage quality for livestock and also to provide better forage for wildlife species. Nine stream crossings were also installed to facilitate cattle and equipment movement from one side of the stream to other for day-to-day farming operations. These stream crossings were installed using filter fabric and gravel to stabilize and prevent erosion of the stream banks. One animal waste system improvement project was installed consisting of 3000 feet of permently installed underground pipe for manure transfer from an existing lagoon to the crop fields were it was to be applied for crop uptake as nutrients. A total of \$333,003.64 was spent to address 2,121 acres using the whole-farm planning technique to address all of the resource concerns on these acres. The 1999 CWAP agreement implemented \$210,880.43 and the 2000 CWAP agreement implemented

\$122,123.21 worth of BMPs. See Appendix F for BMP breakdown. The remaining BMP dollars on this contract are obligated but could not be implemented due to severe drought conditions. Implementation of obligated practices will begin as soon as weather conditions permit.

### **Training & Education**

A public meeting was held at the Fleming-Mason Energy Auditorium where approximately 80 landowners were educated about available cost-share programs. The Kentucky Soil Erosion & Water Quality Cost-Share program, the Phase I & II Tobacco Settlement Programs, the Environmental Quality Improvement Program, the Conservation Reserve Program, and the Fleming Creek Clean Water Action Plan were all explained as to the available cost-share incentives, available BMPs and qualifications and criteria for each program. The meeting ended with Redwing Ecological Services giving a brief overview of the water quality monitoring conducted in the Fleming Creek watershed that was completed in 2004 & 2005.

A farm field day was held on the Spencer Rapp & Family farm. Topics of discussion were intensive/rotational grazing, pond management, fencing, soil management, forestland management, wildlife management, hay storage, and cattle ID/Farm Premise Numbers. This farm demonstrated many of the BMPs that are available through the CWAP program, but were installed with no cost-share assistance.

Education and training is done on a daily basis in the Fleming County Conservation District. Everyday we are faced with the challenge of educating the farmers of this community on water quality, the importance of BMP implementation, and sound farm management practices. These are the issues we try to communicate to every landowner and landuser that enter our door requesting assistance. Many times we cannot offer monetary assistance, but we can always offer our knowledge and expertise in improving water quality to enable agriculture to become a sustainable endeavor. We at the Fleming Co Conservation District strive to educate the entire community about water quality. The District works in cooperation with many agencies to accomplish this goal. The District sponsors and trains 2 Envirothon teams, the 2006 teams placed 6<sup>th</sup> and 7<sup>th</sup> at the regional competition where they competed in soils, aquatics, forestry, wildlife and renewable energy. The District also supports the FFA Soil Judging team with technical resources, the 2006 team places first in the state competition and went on to compete in the national competition in Oklahoma. The District also sponsors and coordinates an Annual 5<sup>th</sup> grade Environmental Field Day where approximately 200 5<sup>th</sup> grade students are educated on environmental issues including water quality, air quality, recycling, forestry, forest fires, and wildlife. Environmental education programs are offered to all of the local schools on request, the CWAP Coordinator is certified by Project Wet, Project Wild, Plants, Land & People, Project Learning Tree, and is a certified KY Master Water Educator. The project coordinator also works closely with the Licking River Watershed Watch and Water Watch. Water quality and conservation education is a main goal for everyone at the Fleming County Conservation District.

### **Water Quality Monitoring**

The Water Quality Report is found as Appendix F. Redwing Ecological Services, Inc., the independent contractor hired to complete the monitoring and data analysis for this project has prepared this portion of the report.

### **Conclusions**

The Fleming Creek Clean Water Action Plan has been and continues to be a work in progress. The Fleming Creek watershed has shown many improvements from the time when the first interest was taken in the late 1980's, however there is still much work to be done. Interest in the water quality of Fleming Creek began as a grassroots effort lead by local landowners with an interest in water quality, conservation, and sustainable agriculture. This group of dedicated individuals took the initiative to bring their concerns for the watershed to light. The hardest challenge has been to change how we think about landuse and how it will affect water quality in the future. Fleming Creek watershed is a large diverse watershed that is ever changing. Agriculture as a whole in this area is radically changing with the changes in the tobacco program, and a shift from dairy production to beef production; everyone is faced with the challenge of adapting to these changes. Farming is very uncertain at this time and no one knows what tomorrow might bring, but we as the educators must learn to face and address these changes as they evolve. By being adaptable we will be able to assist the landowners and landusers in using their land in an environmentally friendly way to allow for sustainable agriculture to become a reality.

Focusing our efforts in the sub-watersheds with the most degraded water quality has lead us to understand the entire Fleming Creek watershed is too large to address with the shotgun approach of BMP implementation. By targeting BMP implementation in the sub-watersheds we can see water quality improvement on a smaller scale that cannot be seen when attempting to address the entire watershed as a whole. Utilizing the whole-farm planning process and addressing all of the resource concerns on the farm has lead us to realize we can improve water quality one small acreage at a time.

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