EPA §319(h) Nonpoint Source Project
Final Report

"Brushy Creek Sediment, Habitat, and Water Quality Investigation"

EPA 319(h) Grant # C9994861-10

Application #: EEC-DOW-NPS Brushy 10-14

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Executive Summary

The Brushy Creek Sediment, Habitat, & Water Quality Investigation project had two key components. First was the education component to educate local people in and around the watershed of the importance of clean abundant surface water. Secondly, was a monitoring program designed to investigate: fine sediment source, siltation, nutrient and pathogen sources, and habitat condition of the Brushy Creek watershed. This monitoring investigation will lead to the development of a watershed based plan to direct additional activities within the watershed.

The education efforts were geared toward conservation management of livestock, soil health and cover crops related to improving water quality leaving the individual producer's farm which in turn equates to improved water quality on a watershed scale. This was accomplished through a multitude of field days/workshops geared toward cover crops and improving soil health. Also, conventional tobacco is still a large part of the farm commodity produced in the Brushy Creek watershed so a companion effort was conducted to education producers on the effectiveness of no-till tobacco compared to conventional. Additionally, multiple school visits were made on overall environmental education and watershed health at schools in and around the Brushy Creek watershed.

All monitoring efforts fulfilled the ~~minimal~~ requirements outlined in the Watershed Planning Guidebook for Kentucky Communities and were conducted in accordance with the KDOW approved QAPP. The proposed sites for Phase I monitoring were based on proximity to the mouth of major tributaries; safety and accessibility of equipment; proximity to a bridge for flood flow measurement and sample collection; and ~~likely~~ landowner co-operation. Phase II monitoring sites were based on findings of the Phase I monitoring. All monitoring results and conclusions are illustrated in the Watershed Data Analysis Report.

The goal of the monitoring effort was to characterize the water quality and habitat of the Brushy Creek watershed and to provide information ~~that will be~~ used to develop preliminary recommendations for future BMP implementation. In addition, this project has enabled several educational and relationship building opportunities within the watershed. Through these opportunities and the water quality monitoring efforts all project goals and objectives were met. We look forward to the possibilities of expanding on these relationships to build further on the continued water quality conservation efforts in the watershed.

Introduction & Background

Brushy Creek drains into Buck Creek, which is listed as an Outstanding State Resource Water (OSRW) and contains several federally endangered Cumberlandian mussel species. The Pulaski County Conservation District (PCCD) is committed to reducing NPS in Pulaski County and especially in the Buck Creek Watershed due to the threatened and endangered species associated with the watershed. Bee Lick Creek, tributary to Brushy Creek, was listed as partial support for warm water aquatic habitat in the 2008 303(d) list. In Bee Lick Creek, siltation due to agriculture, resource extraction (dredge mining), and all-terrain vehicles have been identified as issues of concern.

The purpose of this project is to increase the ability of local stakeholders and project partners to make management decisions that will ultimately improve the water quality in the watershed, improve the fate of endangered species and improve local stewardship of Brushy Creek. The goals of this project are threefold: (1) build good working partnerships in Brushy Creek; (2) characterize the water quality and structural and hydraulic/ hydrologic habitat in the Brushy Creek watershed; and (3) finalize watershed goals and identify solutions. An additional goal for a future project would be a biological inventory of the Brushy Creek watershed which would tell us if the endangered species found in Buck Creek are also found in Brushy Creek.

To meet these goals the following objectives were completed: (1) conduct public outreach to encourage stakeholder involvement; (2) co-ordinate 319 monitoring with PCCD/ NRCS BMP implementation; (3) identify data collection needs based on existing data for Brushy Creek watershed; (4) estimate pollutant loads and identify sub-watersheds for additional investigation; (5) identify pollutant causes and sources within selected sub-watersheds; (6) determine the load reductions that would be necessary to meet water quality standards; and (7) plan the next steps for improving water quality in Brushy Creek watershed.

Materials & Methods

Brushy Creek is a 4th order tributary to Buck Creek. This watershed encompasses 28,414 acres in the counties of Pulaski (15,941 acres), Rockcastle (10,636 acres), and Lincoln (1,837 acres). The Brushy Creek Watershed is within the Cumberlands and Southern Ridge and Valley Ecoregion. The area is underlain by Mississippian limestones. The majority of floodplains in Brushy Creek are underlain by the Sunbury Shale, Berea Sandstone and Bedford shale members of the Borden Formation which are not karst prone. Hillslopes are primarily the underlain by the Salem, Warsaw and Harrodsburg limestones which are minor karst prone. Only a small area in Brushy Creek is underlain by intense karst prone rocks of the Ste. Genevieve and St Louis members of the Slade formation. The karst areas are typically located on ridgetops at very small drainage areas.

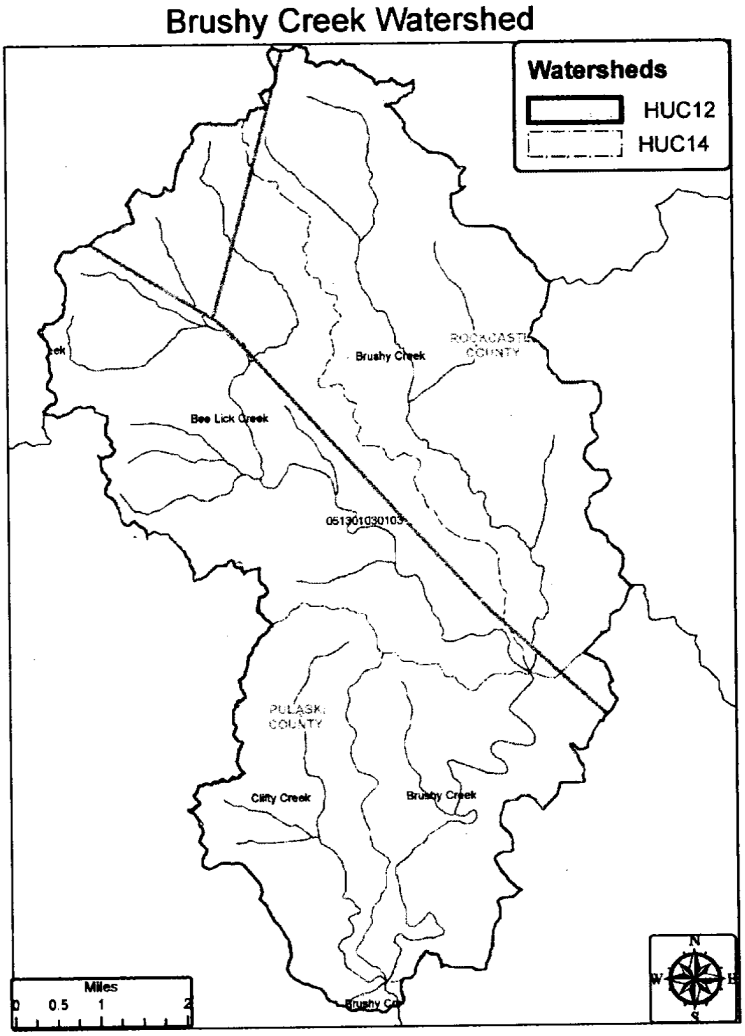

Figure 1. Map of the Brushy Creek Watershed.

Historically, this area has had numerous fords (low water stream crossings) on the creeks of this watershed, which were used for travel between communities, and to access farmland. Crossings are located at shallow riffles and shoals, areas of importance to many aquatic organisms, including mussels. Repeated vehicular and/or livestock crossing and erosion of roads leading to fords can homogenize the substrate, degrade water quality, and adversely impact benthic aquatic organisms (i.e., mussels, other macroinvertebrates, and fish). There are two known unimproved county road crossings in the Brushy Creek watershed and several on private farm roads.

There are no towns located within the Brushy Creek Watershed; only rural communities. These communities were founded by good country folks making a hard-earned living off of the land. However, over the years there has been a gradual loss of the deep appreciation for the land and a degradation of the streams has resulted. The damage done to the land and streams is reversible but requires scientific knowledge of the current conditions, community understanding of the importance of the natural resource and in investment in land management.

Based on the review of the limited existing data for the entire Brushy watershed and the guidance provided in the Watershed Planning Guidebook for Kentucky Communities (KWA and KDOW 2010), monitoring of all sub-watersheds was determined to be necessary. The goal of the monitoring effort was to characterize the water quality and habitat of the Brushy Creek watershed and to provide information that will be used to develop preliminary recommendations for future BMP implementation.

Two phases of monitoring were implemented to achieve this goal: 1.) Phase 1 pollutant identification: One year of monitoring was conducted to identify parameters of concern and sub-watersheds not meeting water quality standards. 2.) Phase 2 source identification: Further monitoring was used to locate the sources for parameters of concern. The results of Phase 1 sampling were used to identify sub-watersheds for Phase 2 sampling. Priority was given to those sub-watersheds where nonpoint source pollutants were in excess of surface water standards (if available) or aquatic life benchmarks. Where standards are not available, priority was given where the pollutants were elevated relative to other reaches in Brushy Creek.

The Brushy Creek HUC10 watershed comprises four HUC14 sub-watersheds. Of these, the two southern sub-watersheds, Clifty Creek and Lower Brushy Creek, drain less than 10 mi^2 combined and were selected as a monitoring unit. The two northernmost HUC14s drain more than 10 mi^2 each, and both were subdivided in to two monitoring units—Upper and Lower Bee Lick Creek, and Upper and Middle Brushy Creek—to capture variation within the HUC14. The main criterion for four of the Phase 1 monitoring sites was proximity to the mouth of a HUC14 to capture the loads from these sub-watersheds and to permit comparisons between each sub-watershed to be made, as suggested in the Watershed Planning Guidebook for Kentucky Communities. In the northern HUC14s of Brushy and Bee Lick creeks, an additional monitoring station was needed to split each HUC14 into two sub-watershed as of relatively similar sizes. In Brushy Creek, the additional site was selected primarily based on road access. In Bee Lick Creek, the additional site was identified based on field visits and input from project partners who had identified that siltation was common in that reach. For all sites, the specific

location of monitoring equipment was based on safety and accessibility of equipment, proximity to a bridge for flood flow measurement and sample collection, and landowner cooperation.

Water quality was assessed using a combination of grab samples and continuous measurements. Water level (stage) was also measured continuously because variations in water level are an important influence on pollutant transport. In addition, continuous measurements of conductivity, turbidity, and temperature were made at all monitoring stations. The continuous data provide information on the stream response to rainfall events, which are often hard to sample effectively on small streams, and these data provide a better understanding of cause-and-effect relations than a few grab samples would.

During each sampling event, the reach was photo-documented with synchronized photos and GPS readings. Any changes in channel configuration (e.g., bank erosion or bar deposition) were recorded. The flow status over riffles was recorded. Habitat assessments were conducted at each monitoring reach following the protocols in USEPA's Rapid Bioassessment Protocols for Use in Wade-able Streams and Rivers. Each habitat assessment was conducted in a reach at least 500 ft. in length but not exceeding 800 ft. All habitat assessments were conducted by the same operator to minimize operator variance. The habitat evaluation consists of ten parameters rated on a numerical scale from 0–20: 1.) Epifaunal substrate/ available cover 2.) Embeddedness 3.) Velocity/depth regime 4.) Sediment deposition 5.) Channel flow status 6.) Channel alteration 7.) Frequency of riffles 8.) Bank stability (left and right banks scored separately on a 0–10 scale) 9.) Vegetative protection (left and right banks scored separately on a 0–10 scale) 10.) Riparian vegetative zone width (left and right banks scored separately on a 0–10 scale). The scores for each parameter are then summed to provide an overall score, which is also assigned to a rating category (poor, fair, or good).

In addition, the phase 2 monitoring parameters selected for further investigation were those determined through Phase 1 assessment and project partner experience to be exceeding benchmark concentrations or to be otherwise impairing the designated uses in Brushy Creek (either WAH or PCR). The selection process was conducted in conjunction with personnel from K DOW's Watershed Management and Water Quality branches and PCCD. The sub-watersheds selected were those in which the parameter concentrations were observed or where the designated use appeared to be most impaired. Siltation was assessed in the Lower and Upper Bee Lick sub-watersheds, dissolved oxygen throughout the Brushy Creek HUC10 watershed, and nutrients within Upper Bee Lick and Upper Brushy Creek sub-watersheds. These sites were selected as provisional based on accessibility by road and drainage area greater than 1 mi^2. Final site selection was made during the field visits and was based on the presence of a specific problem (riffle embeddedness) or exceedance of a water quality threshold (DO <5 mg/L).

At each site, a habitat assessment was conducted in a reach between 500 and 800 ft in length. The assessment followed the same standard protocol as in Phase 1. Each reach was photo documented with particular focus on the riffle substrate and potential sediment sources such as eroding stream banks. The presence or absence of cattle in the creek was also noted. At any site where widespread embeddedness was noted, a detailed evaluation of sediment sources and loads was initially planned to be conducted, but this proved to be unnecessary because macro-invertebrate sampling showed that the embeddedness was not impairing the aquatic life.

The YSI 6920 V2-2 sonde at BL1 was deployed in late summer and utilized through fall of 2013 to provide on line measurements of dissolved oxygen. The data were monitored to identify periods when DO was approaching surface water standards. Prolonged low DO was then the criterion for additional field sampling. A cellular modem enabled the data to be viewed online within one hour after they were collected. The online DO data were monitored to identify a decline in DO values to the point where additional sampling would be conducted to determine the spatial extent of the low dissolved oxygen. The additional DO sampling was completed using the same handheld instrument as in Phase 1.

Nutrient and E. coli samples were collected May 6, 2013, following a period of rainfall, in order to capture runoff samples. Grab samples were collected one time at each site for nutrient parameters (Fig. 3.5). In addition, E. coli samples were collected because the additional sample analysis cost was small relative to the cost of travel and personnel.

Finally, the education component of this project consisted of educational sessions for elementary school children regarding environmental issues. These sessions were aligned with Kentucky's Program of Studies for Grades Primary-12. In addition, educational training workshops and/or field days for adults were conducted focusing on environmental issues such as: agricultural production and utilization GPS technology. However, the ultimate goal of these educational activities was to create an increased awareness and involvement of local community in the overall Brushy Creek watershed as well as the 319 project. Without community and stakeholder education and/or involvement we, as conservationist, are simply missing our target.

Results & Discussion

Wasn't this to write a WBP.

The purpose of this project is to increase the ability of local stakeholders and project partners to make management decisions that will ultimately improve the water quality in the watershed, improve the fate of endangered species and improve local stewardship of Brushy Creek. The goals of this project are threefold: (1) build good working partnerships in Brushy Creek; (2) characterize the water quality and structural and hydraulic/ hydrologic habitat in the Brushy Creek watershed; and (3) finalize watershed goals and identify solutions.

Results?

Environmental and watershed education efforts were a large part of this project identified through goal 1 of project application. We began our efforts of building working partnerships, engaging local stakeholders, and conducting public outreach on August 2, 2012 with an on-farm cover crop workshop (see flyer/agenda appendix D). This workshop was attended by over 60 participants. The workshop focused on the benefits of improved soil health through keeping living plants growing as much of the year as possible, minimizing the amount of soil disturbance, feeding the microbes in the soil (see figures 2-5 appendix D). John Graham, soil health specialist with USDA-NRCS, performed a slake test to illustrate the effects of tillage on soil and how it effects the soil quality. Also, the GPS light bar unit purchased as part of this project was setup at the workshop to demonstrate how no spray zones could be mapped to help insure grassed waterways and other sensitive areas such as stream buffers stay in grass. In addition, cover crop seed dealers were on site to discuss seed availability, pricing, application timing, and application methods.

On March 21, 2013 we participated in an agriculture/environmental day at Broadhead Elementary School to educate 4th and 5th grade students about watersheds, Brushy Creek, and issues that the Conservation District works with on a daily basis. Through this event we were able to reach 140 students. In addition, we were able to distribute watershed bookmarks and activity sheets purchased through this project.

On March 22, 2013 we conducted a Soil Health/Cover Crop Management Tour and Workshop which was attended by 29 participants (see attached flyer appendix D). The day started with a tour to three tobacco farms looking at various cover crop mixtures and planting variations (see figure 6 and 7). After a brisk morning in the field we came back to the Pulaski County Extension Service classroom to learn more about soil quality, farm bill programs, FSA compliance, and conservation plans (see figure 8 – 11). Finally, on that afternoon we returned to the field to look at cover crop scenarios as a part of a corn and soybean rotation. Also, participants received a packet of soil health and cover crop information to take home as well as a copy of the *Midwest Cover Crop Field Guide.*

On May 9th, 2013 we conducted an on-farm field day for additional education of soil health and to do in field demonstrations of the no-till tobacco trans planter and roller crimper (see flyer appendix D). This workshop was attended by 75 producers. We started the event with additional soil health education and no-till trans-planter demonstration (see figures 16, 18, & 19). Also, UK extension staff conducted a session on sprayer calibration and discussed procedures for spraying cover crops to terminate. Finally, John Burnett demonstrated a cover crop roller crimper for the purpose of cover crop termination (see figure 17).

Two Soil Health van tours were conducted, one on July 11th for tobacco producers and one on July 12th for row crop producers. These van tours were a follow-up to the March cover crop workshop to allow producers to get a first-hand view of the cash crops growing in the field ~~growing~~ with the roll down cover crop from spring planting. The van tours were attended by 11 people on day one and 16 people on day two. These tours allow attendees to see the quality of stand achieved planting into roll down cover, moisture retention under the cover, overall health of the cash crop, and other soil health benefits.

As part of the 2013 Kentucky Association of Conservation District Employees Convention we conducted a van tour for District employees from across the state to two farms in Pulaski County. One was a tobacco farm that we showcased a side by side comparison of no-till tobacco and conventional tobacco. The other farm was a grain farm that we had worked with on a demonstration plot utilizing a roller crimper and soil health building cover crop mixes.

On November 1, 2013 we presented a conservation education session at Meece Middle School to approximately 120 1st-5th grade students. Furthermore, on November 21, 2013 we presented watershed health at Pulaski County High School to a group of 10th and 11th grade environmental students. We distributed the watershed health project literature and discussed the Buck Creek and Brushy Creek watershed health as well as current efforts in the Buck Creek watershed to improve water quality.

Additionally, on May 14, 2014 the Kentucky Department of Agriculture mobile science activity center was utilized to showcase some hands-on environmental education activities. Approximately, 150 fourth and fifth grade students went through the hands-on activity center.

Goal 2 of the project consisted of characterizing the water quality and structural and hydraulic/hydrologic habitat. All monitoring fulfilled the ~~minimal~~ requirements outlined in the Watershed Planning Guidebook for Kentucky Communities and was conducted in accordance with the KDOW approved QAPP.

Overall, the habitat in Brushy Creek was mixed: lower reaches with larger drainage areas had good habitat with good fish populations and good macroinvertebrates. Reaches with smaller drainage areas had poorer habitat with issues primarily relating to sediment deposition (Bee Lick sub-watershed) or unstable substrate (Upper Brushy and Clifty Creek).

Phase 1 monitoring indicated that low dissolved oxygen may sometimes be a problem in the Brushy Creek watershed. Monitoring during Phase 2 was conducted during a wetter year and did not record the same low DO conditions. The macroinvertebrate and fish data indicate that the need to address DO in the watershed is not pressing: if this problem were consistent and persistent, these aquatic communities would have been affected. The data suggest that the low DO is caused by lack of mixing during low-flow periods and not by excess nutrients. BMPs that would increase the amount of flow in the channel, possibly by increasing the connection with groundwater, could be used, but this is a relatively unproven approach and few published studies report having successfully increased dissolved oxygen in a stream channel.

Two main sediment related issues were identified in the watershed: embeddedness in the Bee Lick sub-watershed due to localized bank erosion, and instability of riffle sediments throughout the watershed. Macroinvertebrate sampling in the Bee Lick sub-watershed showed that the embeddedness was not dramatically impacting aquatic insects, at least not in number and type of species. Overall biomass was not investigated. Instability of riffle sediments were due to the incised and entrenched condition of most stream reaches. Removing floodplain sediments to lower bank heights and hence reduce shear stress during floods would be the most effective approach to address both issues. In addition, the riparian vegetation at all sites was limited on one or both stream banks.

Goal 3 has been satisfied by the KDOW approved Watershed Data Analysis Report (appendix F). Furthermore, for additional monitoring results and detailed information correlated to sampling sites refer to the WDAR.

Conclusions

It has been the intent of the PCCD throughout the Brushy Creek project that all stakeholders, landowners, and partners involved in this project be treated fairly and each given adequate opportunities for project input and involvement. We have had the pleasure of working on the project with very capable and willing partners. In addition, we have met and worked with numerous willing landowners through public involvement, education sessions, newsletters, newspaper articles, and other related activities.

The clearest issue in Brushy Creek in terms of the watershed meeting its designated uses was the widespread fecal contamination. The concentrations of E. coli in the watershed frequently exceed surface water standards in all sub-watersheds. Work by Eastern Kentucky University indicates that cattle are the primary source of E. coli, and data collected in this project are consistent with that conclusion. BMPs to reduce the fecal loading from cattle are recommended and could be applied successfully in all sub-watersheds where landowner cooperation can be obtained.

Through this process we have identified management opportunities and constraints. This will lead to not only identifying possible management strategies, but the implementation of those strategies. In conclusion, this project will enable the PCCD to make strides toward protecting and promoting sound conservation which will lead to improved water quality and better overall health of the Brushy Creek Watershed.

Literature Cited

Kentucky Division of Water (KDOW). 2009. Pathogen TMDL SOP. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

Kentucky Division of Water (KDOW). 2010. Draft Integrated Report to Congress on the Condition of Water Resources in Kentucky. Volume II. 303(d) List of Surface Waters. R to Congress 303(d) list. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

Kentucky Division of Water. 1976. The river basin water quality management plan for Kentucky: Upper Cumberland River. Kentucky Division of Water, Frankfort, Kentucky.164 pp.

Appendices

Appendix A: Financial and Administrative Closeout

Application Outputs:

PULASKI COUNTY CD's Milestones

Milestone	Expected Begin Date	Expected End Date	Actual Begin Date	Actual End Date
1. Submit all draft materials to the Cabinet for review and approval.	Duration			
2. Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	Duration			
3. Submit Annual Reports and/or participate in the Cabinets sponsored biennial NPS Conference.	Duration			
4. Identify and contact key stakeholders	Jan 2011	Mar 2011	Mar 2011	July 2011
5. Develop Education/Outreach Project Plan	Jan 2011	Mar 2011	May 2011	Dec 2012
6. Develop Quality Assurance Project Plan (QAPP)	Jan 2011	May 2011	Mar 2011	May 2011
7. Identify areas of future or potential concern	Feb 2011	May 2011	Mar 2011	May 2011
8. Conduct public outreach	Mar 2011	May 2011	July 2012	
9. Identify potential monitoring stations for monitoring	Mar 2011	May 2011	Mar 2011	May 2011
10. Collect all available WQ data	Apr 2011	May 2011	Apr 2011	June 2011
11. Select subwatersheds and parameters for monitoring	May 2011	May 2011	May 2011	Current
12. Submit QAPP to KDOW	May 2011	May 2011	Apr 2011	May 2011
13. Collect Phase I flow and pollutant data	May 2011	Sep 2012	May 2011	Nov 2012
14. Submit education materials to KDOW for approval	May 2011	Jun 2011	Jul 2012	Mar 2013
15. Submit written notice of adult training meeting	Jun 2011	Jul 2011	Jul 2012	Jul 2012
16. Adult training workshop and/or field day	Jul 2011	Sep 2011	Aug 2012	Aug 2012
17. Submit written notice of environmental education dates	Aug 2011	Mar 2012	July 2012	Current
18. Conduct environmental education session at schools	Sep 2011	Apr 2012	Mar 2013	Current

19. Submit written notice of adult training meeting	Jun 2012	Jul 2012	Feb 2013	March 2013
20. Adult training workshop and/or field day	Jul 2012	Sep 2012	March 2013	Sept. 2013
21. Analyze site data	Sep 2012	Dec 2012	Sep 2012	Jan 2013
22. Select Subwatersheds and develop a monitoring strategy for the Phase II subwatersheds	Dec 2012	Mar 2013	Jan 2013	April 2013
23. Select sampling sites for low and high flow access.	Apr 2013	May 2013	April 2013	May 2013
24. Review QAPP and make changes if necessary.	Apr 2013	May 2013	April 2013	May 2013
25. Submit revised QAPP to KDOW	May 2013	May 2013	May 2013	May 2013
26. Conduct synoptic sampling in subwatersheds	May 2013	Dec 2013	May 2013	Oct 2013
27. Map and analyze distribution habitat.	May 2013	May 2014	May 2013	Nov 2013
28. Analyze data to estimate causes for pollutants	Jan 2014	Apr 2014	Nov 2013	Feb 2014
29. Conduct meeting with stakeholders	Apr 2014	May 2014	Apr 2014	
30. Review results with KDOW and project partners.	Apr 2014	Jun 2014	Apr 2014	May 2014
31. Submit draft of Watershed Data Analysis Report to KDOW for review	May 2014	May 2014	Apr 2014	May 2014
32. Receive KDOW comments and make revisions as needed.	Jun 2014	Aug 2014	Apr 2014	Sept 2015
33. Submit final Watershed Data Analysis Report	Sept 2014	Sept 2014	Sept 2015	Sept 2015
34. Upon request of the Division of Water, submit Annual Report and/or participate in the Cabinet sponsored biennial NPS conference	Duration			
35. Submit two copies of the Final Report and submit two copies of all products produced by this project.	Dec 2014	Dec 2014	Sept 2015	

STATUS OF PULASKI CO. CONSERVATION DISTRICT'S MILESTONES

Provide a brief sentence or two explaining the progress of each milestone. Add onto the information each quarter and bold the new information so it is obvious what work has been completed.

1.) On going.
2.) On going.
3.) Completed and submitted first annual report.
4.) Identified and contacted landowners at the sampling locations to explain the project and obtain permission to access the stream on their property. Working within the watershed we have been able to locate and communicate with landowners about the objectives of the project.
5.) Developed an overall educational plan and submitted to DOW for approval. Submitted revised educational plan.
6.) A QAPP was developed, submitted, reviewed and changes made. The amended QAPP was approved by KDOW and signed by all relevant individuals.
7.) Subwatersheds were evaluated using a rapid windshield survey and previous field observations. Coarse sediment load appears to be greatest in Clifty Creek, which may have implications for riffle substrate stability. Sand load appears to be significantly higher in Bee Lick Creek than in Brushy Creek. Lower reaches of Brushy Creek have lower sand loads, suggest storage or dispersion of sand from Bee Lick Creek. Groundwater contributions from hillside seeps are spatially variable and may be controlling amount of baseflow: it is anticipated that drying of reaches during summer may be an important factor in the health of WAH. Algal growth was greatest at upper Brushy Creek reaches but relatively scarce in the other subwaterheds. Initial identification of areas of concern is finished but field observations will continue under task 10. Finished
9.) Six monitoring stations were established, two in Bee Lick Creek, two in the upper Brushy Creek subwatershed, one in Clifty Creek and one in the lower Brushy Creek subwatershed. Finished.
10.) Existing data suggest greater pathogen loading in the headwaters of Brushy Creek and Bee Lick Creek than in lower reaches. Elevated nutrient levels were measured in Bee Lick Creek subwatershed.
11.) Continuously recording sondes have been monitoring turbidity, conductivity and temperature. One sonde in the 303d-listed subwatershed of Bee Lick Creek is also recoding dissolved oxygen and pH. The sampling sites were also used for collection of nutrient, cBOD, and E.coli grab samples. Also, pressure transducers are recording the water level at all six sites.
12.) QAPP has been submitted and approved. Finished.
13.) Collection of Phase I flow and pollutant data has been completed.
14.) Submitted educational material for approval, and proceeded with purchase of material for school presentations and activities.
15.) Submitted cover crop workshop materials for approval.
16.) Conducted a cover crop workshop to discuss the benefits of utilizing multiple species cover crops along with a roller crimper to improve soil health. The workshop included: John Graham, NRCS State Agronomist, went into detail about soil chemistry/healthy soil, and why we need to

be improving the health of our soils. Bob Pierce from UK discussed no-till tobacco while improving soil health. Chris Pierce from KCTCS discussed GPS technology utilizing the Brushy Creek unit on demo mode. Finally, Tim Harris from Southern States discussed no-till planter calibrations and setup to plant through the high biomass cover crops required for improving soil health.

17.) Submitted approximate dates for education activities.

18.) Conducted an educational session at Broadhead Elementary for 4th and 5th grades on March 21, 2013.

Conducted a conservation presentation at Meece Middle School grades 1-5 on November 1, 2013.

Conducted a watershed health presentation at Pulaski County High School for 10th and 11th graders in Wildlife Club and Wildlife class on November 21, 2013.

Utilized the Mobile Science Activity Center at Shopville Elementary for grades 4 & 5 on May 7, 2014.

19.) Submitted Van Tour/Workshop flyer and newspaper article for approval.

20.) Conducted a Soil Health/Cover Crop Management Tour and Workshop on March 22, 2013 with 29 attendants for the tour/workshop. The tour consisted of tobacco field cover crops in the morning and row crop covers in the afternoon. The workshop portion before and after lunch consisted of FSA compliance, NRCS Conservation Plans, and Soil Health.

Conducted part II of Soil Health/Cover Crop Management on May 9th 2013. The field day was attended by 75 people. The field day consisted of soil health presentation, no-till trans-planter demonstration, sprayer calibration and roller crimper demonstration.

As part of the 2013 Kentucky Association of Conservation District Employees Convention we conducted a van tour for District Employees from across the state to two farms in Pulaski County. One was tobacco farm that we showcased a side by side comparison of no-till tobacco and conventional tobacco. The other farm was a grain farm that we have been working with on a demonstration plot utilizing a roller crimper and soil health building cover crop mixes.

The Pulaski County Conservation District hosted an on farm field day on September 19, 2013 in the Brushy Creek Watershed attended by 150 people. The field day highlighted BMPs that had been installed on the farm over the past few years. The USFW Service rep, Brent Harrell, explained the water quality and environmental benefits of the stream fencing and tree planting. Larry Lewis, USDA-NRCS technician, explained the development of an alternative water system along with rotational grazing. The KY Department of Agriculture representative told participants about the hay testing program and the importance of hay testing. Jon Anderson with KYFW described the benefits of no-till tobacco and the utilization of cover crops in a no-till system.

21.) Completed data analysis.

22.) Utilized data results to establish monitoring parameters for Phase II monitoring.

23.) Based on Phase II monitoring plan and flow patterns from prior year monitoring sites were determined.

24.) QAPP has been reviewed with KDOW and necessary changes have been made.

25.) Revised QAPP has been submitted to KDOW.

26.) Sampling for nutrients in the headwaters of Bee Lick and Brushy Creek was completed. One continuous DO sensor was monitored at Bee Lick 1 to identify potential periods of low dissolved oxygen, which would have triggered field sampling across the watershed had low periods resulted.

27.) Habitat assessment was focused on the Bee Lick subwatershed, since previous field visits had identified the upper portion of this subwatershed to have the most persistent and significant riffle embeddedness due to siltation. Field trips were conducted and the habitat assessment from the RBP was performed.

28.) Analyze data to estimate causes for pollutants. The results of Phase 2 were analyzed and shared with KDOW. Finalization of load calculations, load duration curves and other data analysis. In addition, GIS mapping is in progress for chapter 2. Also chapters 3 and 4 have been started.

29.) Have met with stakeholders on an individual basis and presented some brief updates.
30.) University of Louisville Research Foundation has reviewed results of findings with KDOW.
31.) Draft materials have submitted for review by KDOW.

32.) The revision process is complete.
33). The Final Watershed Data Analysis Report was completed and submitted in September.
34). On Going.
35). Compiling the final report for submission.

Budget Summary:

Original:

24. Budget Summary							
Category	BMP Implementation	Project Management	Education, Training, or Outreach	Monitoring	Technical Assistance	Other	Total Amount
Personnel		$85,000	$12,740				$97,740
Supplies			$4,000				$4,000
Equipment			$3,000				$3,000
Travel			$1,500				$1,500
Contractual				$706,958			$706,958
Operating Costs							
Other							
TOTAL		$85,000	$21,240	$706,958			$813,198

25. Detailed Budget			
Budget Categories (Itemize all Categories)	§319(h) (60% of funds)	Non-Federal Match (40% of funds)	TOTAL
Personnel	$58,644	$39,096	$97,740
Supplies	$2,400	$1,600	$4,000
Equipment	$1,800	$1,200	$3,000
Travel	$900	$600	$1,500
Contractual	$424,175	$282,783	$706,958
Operating Cost			
Other			
TOTAL	$487,919	$325,279	$813,198

Revised: 2/16/16

24. Budget Summary							
Category	BMP Implementation	Project Management	Education, Training, or Outreach	Monitoring	Technical Assistance	Other	Total Amount
Personnel		$86,679.08	$12,740				$99,419.08
Supplies			$3,125.51				$3,125.51
Equipment			$3,000				$3,000
Travel			$695.43				$695.43
Contractual				$706,958.31			$706,958.31
Operating Costs							
Other							
TOTAL		$86,679.08	$19,560.94	$706,958.31			$813,198.33

25. Detailed Budget				
Budget Categories (Itemize all Categories)	§319(h) (60% of funds)	Non-Federal Match (40% of funds)	TOTAL	Final Expenditures
Personnel	$59,651.45	$39,767.63	$99,419.08	$99,419.08
Supplies	$1,875.31	$1,250.20	$3,125.51	$3,125.51
Equipment	$1,800	$1,200	$3,000	$3,000.00
Travel	$417.26	$278.17	$695.43	$695.43
Contractual	$424,174.98	$282,783.33	$706,958.31	$706,958.31
Operating Cost				
Other				
TOTAL	$487,919	$325,279.33	$813,198.33	$813,198.33

The Pulaski County Conservation District was reimbursed $487,919. All dollars were spent; there were no excess project funds to reallocate.

Equipment Summary:

Equipment purchased: Raven Cruizer II GPS Lightbar => $1,800.00

Special Grant Conditions:

No special grant conditions were placed on this project by USEPA.

Appendix B: QAPP for Environmental Monitoring

Appendix C: Educational Plan

Brushy Creek Educational Plan

Planned Event	Estimated Date for Event	Event materials to be submitted to KDOW	Topics to be covered by the materials	Date the pre-event material should be submitted
Conservation Planning Workshop	March 2013	*Advertisement (newspaper article and/or flyer) *Workshop agenda *Powerpoint	What: NRCS Conservation Plans No Spray Zones (grass waterways) Residue Management Cover Crops Who: Brushy Creek Landowners and/or operators Where: Extension Office	By end of January
Cover Crop Van Tour	March 2013	*Advertisement (newspaper article and/or flyer)	*Plan to target both tobacco, corn, and soybean producers in the Brushy Creek area. *We will visit farmers that we worked with last fall to implement cover crops to let landowners see the various mixes first-hand. Where: *Tobacco Cover Crop plot DeBord, Durham, and/or Whitaker *Row Crop plot Anderson, Pierce, and/or Troxtell	By end of January
4th and 5th Grade Earth Day Event	April 2013	*Handouts *Powerpoint	*Plan to schedule and utilize the Kentucky Department of Ag Mobil Science Activity Center to educate students on resource awareness and importance. *Plan to setup Mobil Unit at a	By end of February

			central location such as Northern or Shopville Elementary to target all 4th and 5th graders from the Brushy Creek Watershed.	
5th Grade Farm Fest	October 2013	*Handouts *Powerpoint	*Plan to educate 5th graders about the importance of our farms and the resources related to them. *Plan to setup on a Brushy Creek or Farm Business to target all 4th and 5th graders from the Brushy Creek Watershed.	By end of Sept.
High School Environmental Club	April 2013 and 2014	*Handouts *Powerpoint	*Plan to educate students about the Brushy Creek Watershed and importance of good water quality as well as resource conservation. *Environmental and/or Science Club at Lincoln, Rockcastle, & Pulaski County High Schools.	By end of Feb. 2013 By end of Feb. 2014

Appendix D: Articles, Flyers, and Photos

Appendix F: WDAR