



WEST FORK WHITEWATER RIVER

FINAL 319 GRANT REPORT

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INTRODUCTION

The citizens of Wayne County (and the Soil and Water Conservation District of Wayne County) have a long history of initiating and executing watershed-related projects. In the early 2000's the Wayne County SWCD's efforts were focused on the watershed of the Middle Fork of the East Fork of the Whitewater River. Starting in 2008, it expanded its focus to include the West Fork of the Whitewater River Watershed. In 2014, the SWCD received a 319 grant to implement a WMP for the West Fork of the Whitewater River Watershed.

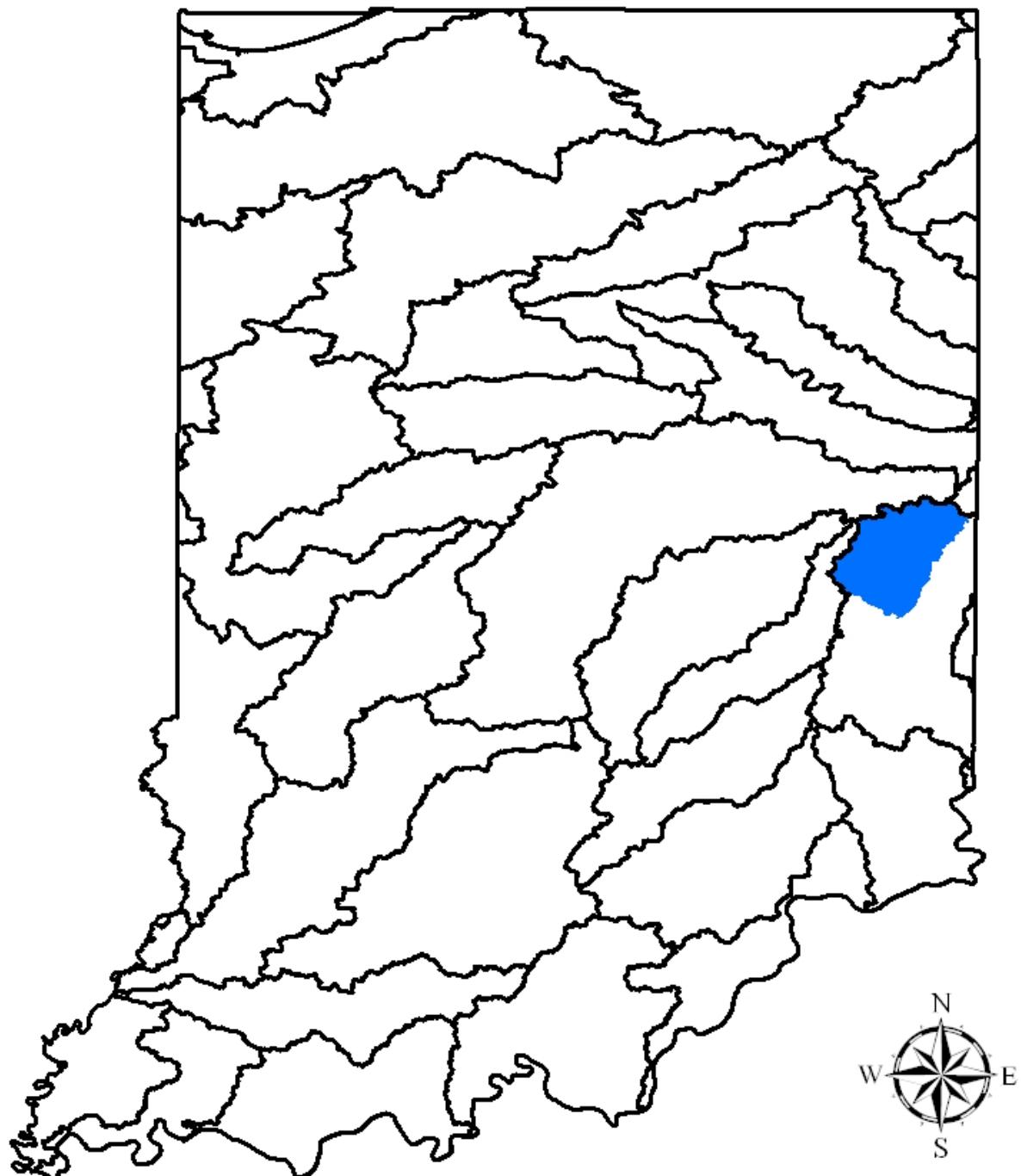
Nearly all of Wayne County, which is located in East Central Indiana, lies in the Whitewater River Watershed (HUC 05080003). This HUC 8 watershed is shown in Map 1 containing an area highlighted in blue. The headwaters of the Whitewater River are northeast of the town of Modoc in southern Randolph County. The river flows in a southerly direction through Wayne, Fayette, and Franklin counties. At the town of Brookville in Franklin County, the East Fork Whitewater River flows into it; it is the East Fork Whitewater River that is dammed upstream of this confluence to create Brookville Lake. From Brookville, the Whitewater River flows southeasterly, entering Ohio near Harrison, Ohio, and continues to flow southward until flowing into the Great Miami River. From this confluence, the Great Miami continues approximately another 7 miles before flowing into the Ohio River east of Lawrenceburg, Indiana.

The West Fork of the Whitewater River Watershed refers to an area containing three HUC 10 watersheds—Martindale Creek (0508000301), Greens Fork Creek (0508000302), and Nolands Fork (0508000303). From west to east, these HUC 10 watersheds span from the southeastern part Henry County to central Wayne County. From north to south, they span from their headwaters in southern Randolph County, to small portions of northeast Fayette County and northwest Union County. It covers approximately 412 square miles and lies within the 1,329 square miles of the Whitewater River Watershed. Land use in the watershed consists of 69% cultivated crops, 11% of hay/pasture 10% of forested, 7% developed, and 3% other. Cities within the watershed include Cambridge City, Centerville, East Germantown, Economy, Fountain City, Greens Fork, Hagerstown, Losantville, Lynn, Milton, and Mount Auburn.

This grant report details the activities funded by a 319 grant for the West Fork of the Whitewater River Watershed, which include a BMP cost-share program, water quality monitoring, education and outreach, and community engagement. Activities were guided by a watershed management plan (WMP) for the West Fork of the Whitewater River, completed in 2011 and also funded by a 319 grant.

The goals of this grant were to 1) develop, promote, and implement a cost-share program, 2) conduct water quality monitoring aimed at showing a decrease in pollutants, 3) seek partner funding to implement a storm drain labeling and septic system campaign, 4) promote BMPs and water quality protection through adult and youth education and outreach, and 5) encourage community involvement in the watershed project.

Throughout the course of this grant project, the Watershed Coordinator position was held by three different persons/companies. Although this report is complete, these changes in the project management have likely decreased the level of detail in this report. The current Watershed Coordinator has done its best to accurately and thoroughly represent the materials and information left by previous Watershed Coordinators.



Legend

0 10 20 40 60 80 Miles

- Indiana HUC 8 Watersheds
- West Fork of the Whitewater River Watershed

MAP 1 | West Fork of the Whitewater River Watershed



EVALUATION OF GOAL ACHIEVEMENT

The goals of this grant were to 1) develop, promote, and implement a cost-share program, 2) conduct water quality monitoring aimed at showing a decrease in pollutants, 3) seek partner funding to implement a storm drain labeling and septic system campaign, 4) promote BMPs and water quality protection through adult and youth education and outreach, and 5) encourage community involvement in the watershed project.

All goals were successfully reached. Noteworthy accomplishments included the development, promotion, and implementation of the cost-share program; the implementation of a storm drain labeling and septic system campaign; and the promotion of BMPs and water quality protection through adult and youth education and outreach. This evaluation is based on the Measures of Success identified in the Project Outcomes and other indicators identified in Section 5A of the 319 project application form. The following describes how each goal was met.

Project Outcome I: Installation of Best Management Practices (BMPs) in the West Fork and Middle Fork Watersheds to improve water quality

Twenty-three (23) landowners were enrolled in 319 cost-share projects in the West Fork. Numerous BMPs, including vegetative and land management and structural BMPs, were implemented: 28,503 sq ft of heavy use protection areas, 12,205 feet of fencing to exclude cattle from streams or to improve livestock distribution, 9 watering facilities to help improve livestock distribution, 1,730 feet of livestock pipeline, nutrient management plans created for 524 acres, 178 acres of forage and biomass plantings, 948 acres of cover crops, 1.5 acres of riparian forest buffer, and 18 conservation plans were written. Zero (0) acres were enrolled into conservation a tillage program.

Project Outcome II: Reduced sediment, nutrients, atrazine loads, and E. coli levels within the watersheds

The Region 5 model was used to estimate pollutant reductions achieved through best management practices implemented in critical areas. According to the Region 5 Model, the following reductions were achieved:

8,097 lb/yr reduction in nitrate in critical areas
3,624 ton/yr reduction in sediment in critical areas
4,072.5 lb/yr reduction in phosphorus in critical areas

Project Outcome III: Implementation of storm drain labeling and septic system campaign

Twenty-six (26) volunteers helped to label 310 storm drains within watershed project boundaries. Thirty-five (35) homeowners received rebates to help with the cost of pumping their septic systems. Donations that helped fund these projects were received through the Wayne County Foundation's Challenge Match Grant. A septic system brochure was distributed to landowners and a septic system maintenance newsletter was created and posted on the Wayne County SWCD website.

Project Outcome IV: Adult and youth education and outreach

117 people attended field days (4 field days)

2,679 people attended education events

3,885 people were taught about water quality protection

Project Outcome V: Involvement in the Watershed Project

14 steering committee members involved; 66 brought waste to Tox-A-Way Day; 3 barrels of oil based/flammable waste, 3 barrels of aerosol cans, and 4 containers of unknown chemicals collected during Tox-A-Way event; 1 volunteer for water monitoring; 26 volunteers for storm drain stenciling, 6 volunteers participated in the West Fork Whitewater River clean-up, more than a dozen volunteers for the Middle Fork Reservoir Cleanup, 18 trash bags were filled with trash at the Middle Fork Reservoir clean-ups and three flat-bottom boats were filled with trash and tires during the West Fork River clean-ups.



COMPLETION OF TASKS

The completion of the following tasks was a requirement in the 319 grant contract with IDEM. All tasks were completed during the course of the project. There were five tasks total, and each is highlighted in gray. The challenges, successes and lessons learned that the project manager would like to highlight are included.

Task A: The Grantee shall develop and promote a cost-share program to implement best management practices (BMPs) such as conservation tillage, forage and biomass planting, livestock exclusion, riparian buffers and others that address the water quality concerns outlined in the West Fork Whitewater Watershed Management Plan (WMP). Details of the cost-share program shall be submitted to the State for approval in accordance with the Section 319 Costshare Program Development Guidelines prior to program implementation.

The Grantee shall promote other conservation programs such as the Conservation Reserve Program (CRP), Environmental Quality Incentive Program (EQIP) and Wildlife Habitat Improvement Program (WHIP). These programs shall also be promoted in the Middle Fork of the East Fork Whitewater River Watershed.

A Cost-Share Program was developed by the Watershed Coordinator and accepted by IDEM in the second quarter of the grant contract. A brochure was created and distributed in an attempt to spread the information about the Cost-Share Program (Appendix A). The Cost-Share Program was promoted at local venues such as education and outreach events, Conservation Workshops, and Conservation Tours. The Cost-Share Program was also advertised in the Pal-Item (a local newspaper) and cost-share brochures were taken to the Harvest Land Co-Ops in Lynn, Richmond, Hagerstown, and Cambridge City. Information about watershed and the cost-share program is included on the Wayne County SWCD website, www.waynecountyswcd.org. A cost-share eligibility application and ranking sheet were created and utilized to identify eligible applicants and rank projects. The Steering Committee reviewed applications and rankings and helped to select projects for funding.

In 2017 the Watershed Coordinator mailed post cards advertising cost-share to over 400 landowners within critical areas. The Watershed Coordinator utilized ArcMap to combine GIS parcel data, mailing addresses obtained through the Department of Local Government Finance, and watershed boundaries. This combined data was used to generate a list of landowners, (including their addresses), located within critical areas. Mailed post cards directed interested persons to telephone the Wayne County SWCD. A total of 34 landowners contacted the SWCD in just a few days. Names and phone numbers were compiled in a spreadsheet and the Watershed Coordinator made follow-up phone calls to ask pertinent questions selected from the cost-share eligibility ranking sheet. The Wayne County SWCD and NRCS assisted in identifying any concerns regarding potential projects.

Challenges:

A previous project manager noted that it was difficult to get people to sign up for the Cost-Share Program. This project manager had some people that were interested in the program, but they were not allowed to sign up since they were not in the priority watersheds. He noted, "The most frustrating thing about following the priority areas for spending is that the landowners were in dire need for implementing best management practices in the watershed.

I guess my thought on this is that you would want to do as much as you can in a watershed as a whole to help the watershed to become healthier.” He also noted that, unlike the past, he had some success in talking people into fencing their livestock out of a sensitive area.

Successes:

Contrary to the first Watershed Coordinator’s experience, the later direct mailing approach were was successful for generating potential cost-share recipients operating within critical areas. Asking landowners to simply telephone the SWCD representative may have been a part of the reason for the success. It was likely easier for an applicant than taking the time to read, fill out, and mail an application.

Task B: The Grantee shall implement the approved cost-share program described in Task A. BMPs shall conform to the Natural Resources Conservation Service Field Office Technical Guide (NRCS FOTG) or other applicable, approved specifications. BMPs shall be implemented only in critical areas as described in the West Fork Whitewater WMP. Up to seventy-five (75) percent of the cost of BMPs will be provided by the federal Section 319 funds (with the exception of Comprehensive Nutrient Management Plan (CNMP) development, where up to ninety (90) percent of the cost will be provided), and at least twenty-five (25) percent must be provided by the landowner or other non-federal source as match. Design costs may be included in the total cost of the BMP, and will be reimbursed after the BMP is implemented. All BMPs must meet the terms and conditions of the 319A or 319U Cost-Share Form, including documentation of actual costs for all BMPs. Urban BMPs (319U Form) must be approved by the IDEM Project Manager before grant funds are allocated to the BMP project. The Grantee shall utilize the Region 5 Load Estimation Model (or other approved model) to provide, when applicable, sediment and nutrient load reductions for every BMP implemented as a result of this project, including BMPs not funded with this grant.

Section 319 funds may not be used to comply with any National Pollutant Discharge Elimination System (NPDES) permit or State rule. The Grantee shall assure that all animal feeding operations (AFO) that receive financial assistance pursuant to this grant have a CNMP in place. Any AFO that is subject to NPDES permit requirements or is designated to be a concentrated AFO (CAFO) under 40 CFR Section 122.23 is ineligible for Section 319 funding.

All Geographic Information System data created or modified by the Grantee for delivery to the State shall meet the Indiana State Agencies Arc/Info Data Collection Standards except for metadata. Metadata shall meet the Federal Geographic Data Committee (FGDC) standard called the Content Standard for Digital Geospatial Metadata. Any deviation from either standard must have prior written approval from IDEM. All Global Positioning System data collected by the Grantee for delivery to the State shall include IDEM's Method Accuracy Description Codes. Any deviation from this requirement must have prior written approval from IDEM. The Grantee shall submit a copy of GIS layers to the State.

Watershed coordinators worked with 23 landowners to implement over 50 cost-share projects in the West Fork of the Whitewater River Watershed. Cost share projects included Cover Crops, Fence, Forage and Biomass Planting, Heavy Use Area Protection, Nutrient Management Plan, Watering Facilities, and Livestock Pipeline. Table 1 below lists the total quantity of each best management practice implemented with 319 cost-share funds.

Table 1 | Best management practices implemented with 319 grant funds

Practices	Quantity Implemented	Unit
Cover Crops	948 acres	acres
Fence	12,205 ft.	feet
Forage and Biomass Planting	178 acres	acres
Heavy Use Area Protection	28,503 ft ²	ft ²
Nutrient Management Plan	524 acres	acres
Water Facilities	9	units
Livestock Pipeline	1,730 ft.	feet
Riparian Forest Buffer	1.5 acres	acres
Conservation Plans	18	units

The Estimated amount of pollutant load reduction from the installed Best Management Practices is based on Region 5 modeling and is shown in Table 2 below.

Table 2 | Modeled reductions (Region 5) from implemented best management practices

Phosphate Reduction	Nitrogen Reduction	Sediment Reduction
4,072 lbs/yr	8,097 lbs/yr	3,624 tons/yr

 Lessons Learned:

The watershed coordinator found that collecting and carefully documenting as much information about the landowner up front was important for thoroughness and efficiency. The watershed coordinator developed a questionnaire for landowners/operators based on IDEM's 319 guidance document and other documents. This was very important in further determining the eligibility of applicants.

 Challenges:

The later project manager was successful in contacting a large number of potential cost-share applicants and working with these applicants to see that projects were completed and funded, the short time period in which they had to accomplish this was troublesome. We would recommend to other groups that they see that the vast majority of their cost-share is spent in the first two years of the project. At the time that the six-month extension of the contract was granted, approximately 49% of the \$130,000 allocated for cost-share had been reimbursed. These reimbursed cost-share projects were completed by ten landowners. A few additional projects were in the works at this time, but were still in the process of being installed. The past watershed coordinator had given a deadline of March 1, 2017 for these projects. With the extension ending on March 31, 2017, this didn't give much time to complete another project if one of these fell through or was below the estimated cost. In order to prepare for the possibility of still having 319 cost-share funds to spend near the contract end-date, the Wayne County SWCD sought and received matching funds through a local foundation that could be used with 319 funds to implement a project on a publicly accessible nature area. This did not happen to be the case; with one cost-share project costing much more than estimated, money needed for cost-share exceeded the 319 budget. Funding from the local foundation was able to be used to provide the remainder of this cost-share to the landowner.

Task C: The Grantee shall conduct an education and outreach program designed to bring about behavioral changes and encourage BMP implementation that will lead to reduced nonpoint source pollution in the watershed. The Grantee shall at a minimum:

1. Create and implement a storm drain labeling program within the West Fork Whitewater watershed.
2. Conduct no less than four (4) public meetings to update stakeholders on the West Fork watershed project.
3. Submit no less than twelve (12) press releases about the project to local media. No less than one (1) press release each year shall be focused on the Middle Fork Whitewater project.
4. Conduct no less than four (4) workshops or field days on topics such as livestock exclusion from streams, pasture walks, cover crops, and septic systems maintenance.
5. Develop and distribute no less than twelve (12) newsletters for watershed residents, with no less than one (1) each year focused on the Middle Fork Whitewater.
6. Create a website to provide information on the project and events. Information shall be updated on no less than a quarterly basis.
7. Conduct no less than twelve (12) West Fork Whitewater steering committee meetings (of the previously formed steering committee) and no less than twelve (12) Middle Fork Whitewater steering committee meetings.
8. Continue to implement a system of recognition for residents that have implemented strategies to prevent nonpoint source pollution through programs such as River Friendly Farmer and Conservation Farmer of the Year.
9. Design and implement educational programs and activities to help communicate the importance of BMPs, ways to reduce nonpoint source pollution, and information about the cost-share program. Information and/or presentations shall be available at events such as Conservation Ag Days, Earth Day, the Wayne County Fair, and other watershed activities.
10. Continue involvement with the Middle Fork conservation agricultural plots to showcase BMPs. No less than one (1) field day referenced in C4 shall be conducted at this location.
11. Conduct no less than two (2) Middle Fork Reservoir clean-ups, two (2) West Fork cleanups, and participate in no less than one (1) Tox-A-Way Day sponsored by the Wayne and Union County Solid Waste Management District.
12. Develop and distribute no less than two (2) brochures that address topics such as the cost-share program and proper septic maintenance.
13. Track participation in project events and the cost-share program and include results in the final report.
14. Provide two (2) copies of products produced as a result of this grant to IDEM.

The West Fork Watershed Project (WFWP) installed storm drain markers in rural cities within the watershed. Table 3 below shows the location, date, and number of volunteers that aided with the installation.

Table 3 | Storm drain markers implemented (Task C, Objective 1)

City	Date	Volunteer Attendance
Greens Fork	4/25/2016	1
Centerville	5/3/16	1
Hagerstown	7/20/2016	6
Fountain City	7/29/2016	3
Milton and Cambridge	9/22/2016	4
Centerville	9/23/2016	9
Centerville and Cambridge City	10/12/2016	2

The WFWP completed all four (4) public meetings for the project. Table 4 below lists the meetings and the dates on which they were held.

Table 4 | Public meetings concerning the watershed project (Task C, Objective 2)

Meeting	Date
Cost-Share Public Meeting	9/15/2015
Lion's Club Public Meeting	11/9/2015
Young Farmers Public Meeting	9/17/2016
Richmond Realty Group Public Meeting	11/14/2016

The WFWP submitted the following twelve press releases (Task C, Objective 3):

- A) Cost-Share (3/21/2015)
- B) Middle Fork Reservoir Cleanup (5/22/2015)
- C) Pre West Fork River Cleanup (8/12/2015)
- D) Post West Fork River Cleanup (9/2/2015)
- E) Learn about Watershed Cost-Sharing Projects (9/9/2015)
- F) West Fork River Field Day (9/16/2015)
- G) Lions Club Public Meeting (12/22/2016)
- H) Middle Fork Reservoir Cleanup (5/25/2016)
- I) 4H Club Labels Hagerstown (8/3/2016)
- J) Local field Day Combined with River Cleanup (8/27/2016)
- K) Whitewater River Cleanup Event Set for Saturday (9/22/2016)
- L) Tox-A-Way Day Set for Saturday

The WFWP conducted five (5) field days. Table 5 below shows the date and attendance for each field day.

Table 5 | Conduct no less than 4 workshops or field days (Task C, Objective 4).

Field Day	Date	Attendance
West Fork River Field Day	10/8/2015	10
Pasture and Livestock Field Day	6/11/2016	44
Forestry and Wildlife Field Day	9/10/2016	13
Conservation Farming Workshop	3/9/2017	50
Conservation Farming Workshop	3/15/2018	50

The WFWP developed and distributed the following 13 newsletters (Task C, Objective 5):

- A) What is a Watershed? (3/25/2015)
- B) Nitrogen Contamination (4/7/2015)
- C) Maintaining your Septic System (4/20/2015)
- D) SWCD Cost-Share Newsletter (6/2015)
- E) SWCD Annual Meeting Newsletter (12/18/2015)
- F) 2015 Watershed Annual Report (1/24/2016)
- G) Benthic Macroinvertebrate Newsletter (4/1/2016)
- H) Urban Pollution Newsletter (6/23/2016)
- I) SWCD Urban Pollution Newsletter (8/26/2016)
- J) SWCD Tox-A-Way Day Newsletter
- K) 2016 Watershed Annual Report (1/29/2017)
- L) Riparian Buffer Zones (4/2017)
- M) Final Newsletter: Project Completion (3/28/2018)

The WFWP shared all information regarding the watershed project on the Wayne County SWCD website under the “Watershed” tab (Task C, Objective 6). Cost-share information and applications were included on the website, as well as quarterly newsletters. Events were also advertised on the Wayne County SWCD website.

The WFWP conducted twelve (12) Steering Committee meetings. Meeting dates and attendance are listed in Table 6 below.

Table 6 | West Fork Watershed Project Steering Committee Meetings (Task C, Objective 7)

Quarters	Meetings	Attendance
2nd Quarter	2/12/2015	10
3rd Quarter	4/8/2015	9
4th Quarter	7/28/2015	5
5th Quarter	10/20/2015	2
5th Quarter (additional)	12/16/2015	5
6th Quarter	2/24/2016	6
7th Quarter	6/15/2016	3
8th Quarter	9/20/2016	4
10 Quarter	1/31/2017	5
11th Quarter	5/9/2017	3
12th Quarter	8/22/2017	5
14th Quarter	1/25/2018	3

The WFWP nominated local farmers for Conservation Farmer and River Friendly Farmer. Table 7 below lists recipients and awards.

Table 7 | Nominate a Conservation Farmer and River Friendly Farmer (Task C, Objective 8)

Name	Award
Steve Gettinger	2015 Conservation Farmer
Kristen Ward	2016 River Friendly Farmer
Willard Newman	2016 Conservation Farmer

The WFWP designed and implemented education programs and activities and had educational booths at the following events (Task C, Objective 9):

- A) Earlham College Wellness Fair (3/5/2015) (4/7/2016)
- B) Wayne County Wellness Day (4/8/2016)
- C) Earth Day (4/25/2015) (4/23/2015) (4/22/2017)
- D) 4H Fair (6/22/2015-6/26/2015) (6/18/2016-6/24/2016)

The WFWP also held the following educational events (also Task C, Objective 9):

- A) Earlham Conservation Tour (3/1/2016)
- B) Envirothon Presentation (3/17/2016) (3/2/2016)
- C) Conservation Days (11/16-11/17/2015) (11/15-11/16/2016),
- D) Centerville Elementary Green Club (3/30/2016)
- E) IVY Tech Conservation Tour (10/17/2016)
- F) Northeastern Middle School Macroinvertebrate Day, 6th graders (9/4/2015) (5/12/2016)
- G) Centerville Elementary Green Club (3/30/2016)

The WFWP was unable to continue involvement with the Middle Fork conservation agricultural plots or to conduct at least one (1) field day at this location because the conservation plots were no longer in existence during the project (Task C, Objective 10).

The WFWP conducted two (2) Middle Fork Reservoir Cleanups, two (2) West Fork River Cleanups, and participated in two (2) Tox-A-Way Days (Task C, Objective 11). Dates and attendance for each event are listed below:

- A) Middle Fork Reservoir Cleanup (6/6/2015; 17 attended) (6/25/2016; 11 attended)
- B) West Fork River Cleanup (8/29/2015; 4 attended) (9/24/2016)
- C) Tox-A-Way Day (10/29/2016; 23 volunteers) (5/13/2017)

The WFWP developed and distributed two brochures (Task C, Objective 12). These brochures are listed below and are also included in the appendix.

- A) Cost-Share Brochure (Appendix A)
- B) Proper Septic Maintenance (Appendix B)

The WFWP tracked participation in project events and the cost-share program and included results in this final report (Task C, Objective 13).

Concurrent with the submission of this final report, the WFWP provided two (2) copies of products produced as a result of this grant to IDEM (Task C, Objective 14).

Task D: The Grantee shall update the existing approved Quality Assurance Project Plan (QAPP) for the monitoring activities and submit it to the State for approval at least one (1) month prior to initiating monitoring activities. The Grantee shall conduct all monitoring activities and submit all data in accordance with the approved QAPP.

The Grantee shall conduct a monitoring program to collect data trends in water quality in the West Fork and Middle Fork watersheds. The Grantee shall conduct volunteer monitoring using Hoosier Riverwatch methods monthly from April to October for the duration of the project. Parameters collected shall include phosphorus, nitrate, dissolved oxygen, pH, total suspended solids, temperature, and flow. E. coli shall be collected weekly for five (5) weeks once during April through October. Habitat and macroinvertebrate data shall be collected no less than one (1) time per year. The Grantee shall collaborate with the QAPP coordinator to determine the number of monitoring sites. The exact locations of the monitoring sites shall be specified in the QAPP to be approved by the State.

The project manager worked with IDEM to create a QAPP, which was approved by IDEM on April 14, 2015.

A detailed assessment of the water quality monitoring is included in the next section.

Task E: The Grantee shall prepare and submit an electronic copy of a progress report to the State with each invoice, on at least a quarterly basis. A total of no less than eleven (11) quarterly progress reports shall be prepared and submitted by the Grantee to the State. The Grantee shall prepare and submit two (2) electronic copies of a final written summary project report to the State by the close of the project.

14 progress reports and invoices were prepared and submitted to IDEM on a quarterly basis. Two electronic copies of this final report were submitted to the IDEM.



MONITORING RESULTS

Monitoring was conducted in both the West Fork of the Whitewater River and the Middle Fork of Whitewater River. The goals were to identify if there have been improvements in both the West and East Forks due to BMPs, to update data, to further narrow down where potential non-point sources are located in the watershed, and to update the WMP.

The four major contaminants identified by the West Fork of the Whitewater River Management Plan are: E. coli, elevated nutrient load, elevated sediment load, and elevated levels of Atrazine.

The Watershed Coordinator was responsible for supervising all data collection. Indiana American Water Company completed Atrazine testing on samples collected by the Watershed Coordinator. One volunteer also participated in sampling on two separate occasions.

Eighteen (18) sample sites were identified in the QAPP. Fourteen (14) sample site were located in the West Fork Whitewater River Watershed (Table 1). Four (4) sites were located in the East Fork Whitewater River Watershed (Table 2). However, only 14 of these sample sites were actually monitored. Sites identified in the QAPP but not sampled were site numbers 1, 9, 13, and 17. Parameters monitored were DO, BOD, pH, P levels, N levels, habitat, and flow velocity. Sites within the West Fork Watershed were monitored monthly from April to October, from 2015-2017 (MAP 3). Sites within the Middle Fork Watershed were monitored biannually from 2015-2017, once in the spring and again in the fall. In both the West Fork and East Fork, E. coli samples will occur annually collected 5 times evenly spaces over a 30 day period with the geometric mean calculated. In both the West Fork and East Fork macroinvertebrate collections will be done annually at all of the test sites.

Atrazine was also monitored from April to August, during the chemical's peak usage. This date range was set because Indiana American Water only test for Atrazine during this time period. Atrazine levels were very low throughout the 2015 and the spring of 2016. Due to the low levels, the decision was made to not continue atrazine testing for the remainder of the project. It is possible that past educational initiatives have resulted in these decreases in atrazine in the watershed. Atrazine has been on the forefront of the water quality for some time. From 2006-2006, the US EPA's Ecological Watershed Monitoring Program sampled atrazine in Noland's Fork of the Whitewater River. Noland's Fork is within this project's study area.

Water quality monitoring was not done from April 2015 to July 2015 due to high rainfall creating possibly dangerous water levels in the streams and rivers.

The following analysis includes a comparison of 2015-2017 data to 2009-2010 data at sites that were comparable, as well as a discussion of 2015-2017 results.

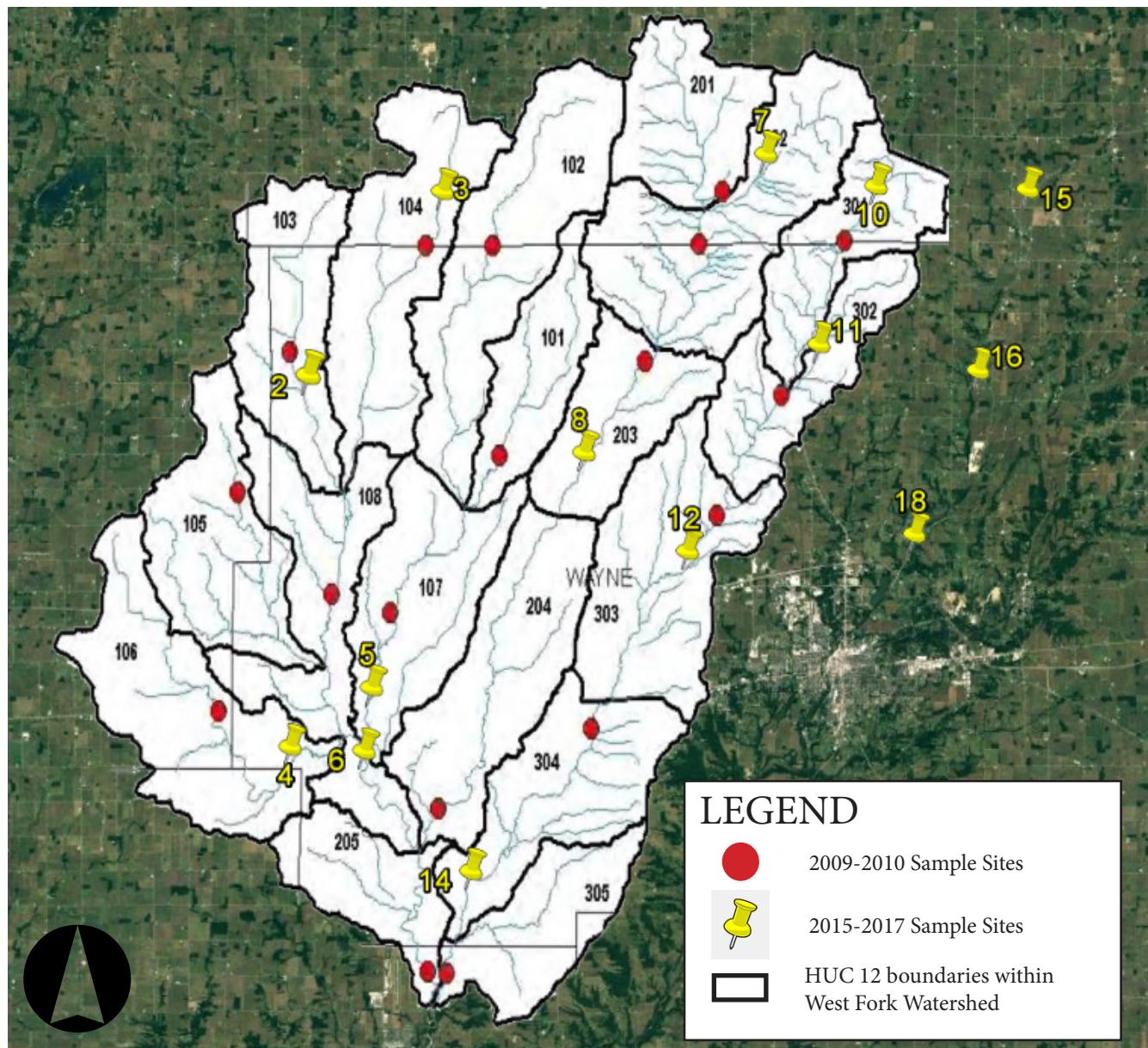
TABLE 8 | Location of Sample Sites within the West Fork Whitewater Watershed

Site Location	Site Number	Last 3 Digits of HUC 12 (050800030-)	Latitude	Longitude
Mendenhall Rd. @ Martindale Creek	1	102	39.964208	-85.106725
Hoover Rd. @ Nettle Creek	2	103	39.941850	-85.182540
W 1100 South @ Whitewater River	3	104	40.018836	-85.109582
Wagner Rd @ Symons Creek	4	106	39.788496	-85.191719
U.S. 40 @ Martindale Creek	5	107	39.813108	-85.147726
Milton Rd @ Whitewater River	6	108	39.786864	-85.151778
E 900 South, Lynn @ Greens Fork	7	202	40.034327	-84.934536
Smokey Row Rd @ Greens Fork	8	203	39.910529	-85.033059
E Co. Rd. 440 (Fayette County) @ West Fork Whitewater River	9	205	39.703947	-85.114413
CR 1000 South @ Nolands Fork Headwaters	10	301	40.020855	-84.874985
W Fountain City Pike @ Fountain Creek	11	302	39.955377	-84.905961
King Rd W @ Nolands Fork	12	303	39.869682	-84.977061
Colvin Rd. @ Nolands Fork	13	304	39.804892	-85.026059
Pottershop Rd @ Nolands Fork	14	304	39.736980	-85.094162

TABLE 9 | Location of Sample Sites within the East Fork Whitewater River Watershed

Site Location	Site Number	Last 3 digits of HUC 14 (05080003070-)	Latitude	Longitude
Weaver Fort-Jefferson Rd@ East Fork River	15	030	40.019396	-84.792778
Whitewater Rd. @ East Fork White-water River	16	030	39.944471	-84.819841
Inke Rd. @ East Fork Whitewater River	17	030	39.909741	-84.823251
IN-227 @ East Fork Whitewater River	18	040	39.876621	-84.854485

MAP 2 | Location of 2009-2010 and 2015-2017 Sample Sites*



*Sites 15, 16, and 18 are within the Middle Fork Whitewater River Watershed

Comparison of 2015-2017 Data to 2009-2010 Data

Water quality data was also collected in 2009-2010 as part of the watershed management planning process. However, it was difficult to compare this data to current data due to differences in sample site locations. Map 2 on the previous page shows the sampling locations in 2009-2010 and 2015-2017. It is apparent from the map that site locations varied widely between the two sampling time periods. Therefore, any differences in a pollutant may be just as likely to be due to a sampling location being located upstream of major sources than a potential reduction in the pollutant. Because of this problem, we have only compared sites that are geographically the closest (however, these sites can still be over 2-3 miles away and this should be kept in mind).

Based on these comparisons, average nitrate was lower in 2015-2017 at sites 2, 3, 4, 5, 8, 10, and 12 (Figure 1). Average orthophosphate increased at sites 3, 4, 5, 10, and 12, and slightly decreased at sites 2 and 8 (Figure 2). Average E. coli increased slightly at most sites, with a large increase at site 2 and a slight decrease at site 3. Average E. coli levels are still far above the Indiana State Standard (Figure 3). Average turbidity generally remained the same. Average turbidity decreased by almost half at site 2, but was still over three times the US EPA recommended level and 3 to 11 times higher than the other sites that were compared (Figure 4).

Atrazine averages decreased from 2009-2010 to 2015-2017 (Tables 3 and 4). A site to site comparison was not included because improvement was seen watershed wide. Present levels are below the EPA drinking water standard of 3 ppb.

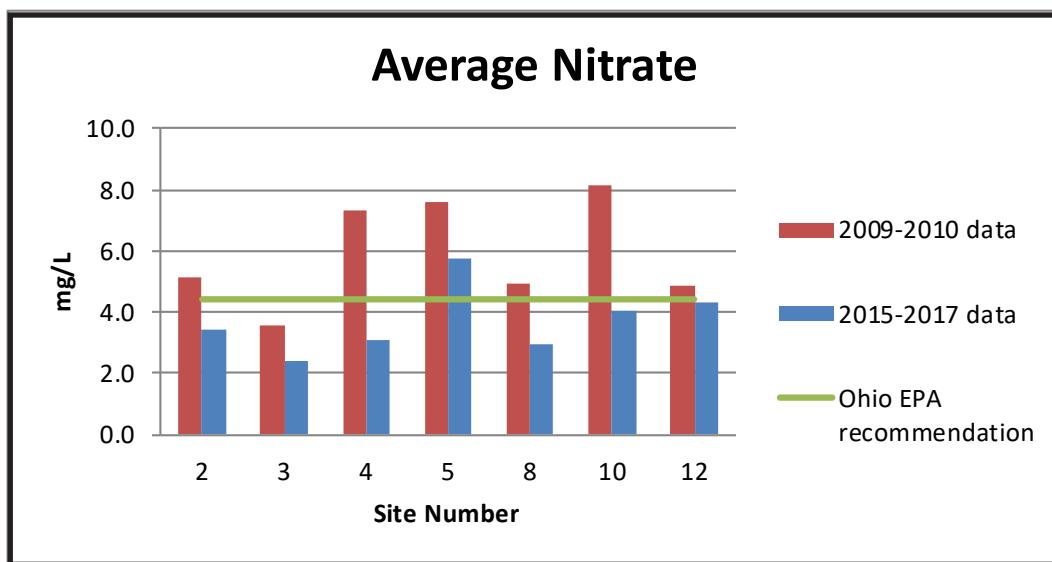


FIGURE 1 | Average nitrate during 2009-2010 and during 2015-2017

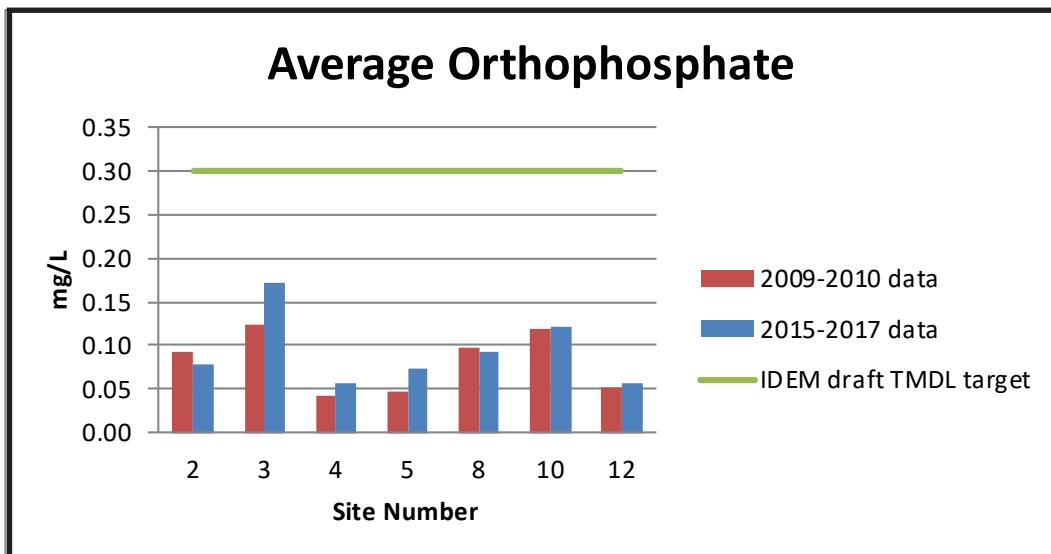


FIGURE 2 | Average orthophosphate during 2009-2010 and during 2015-2017

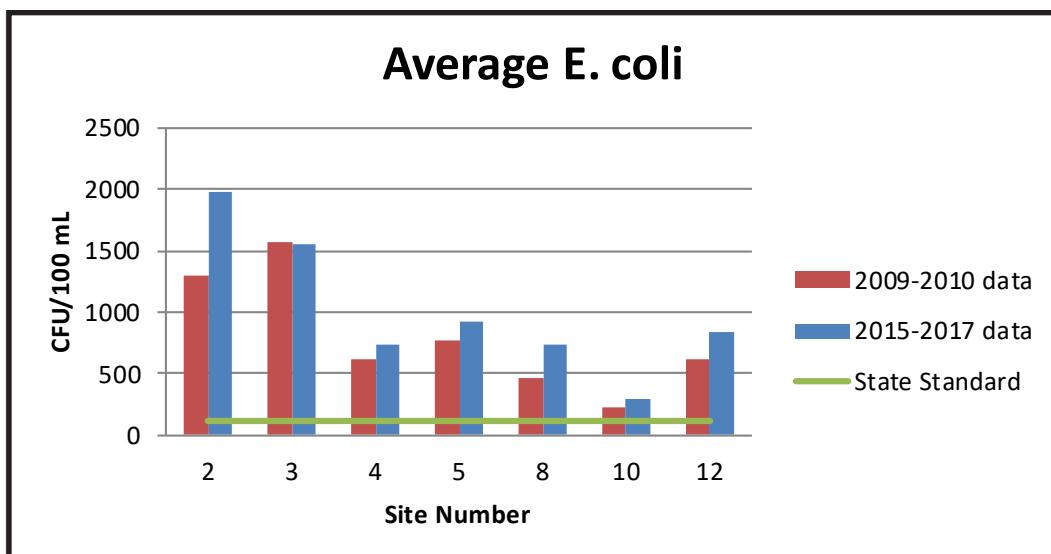


FIGURE 3 | Average E. coli during 2009-2010 and during 2015-2017

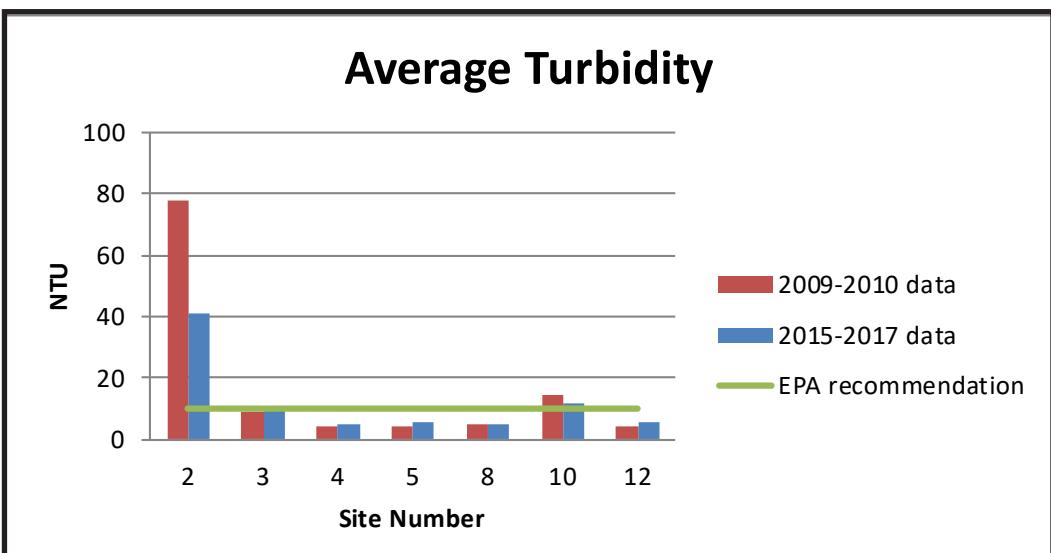


FIGURE 4 | Average turbidity during 2009-2010 and during 2015-2017

TABLE 10 | 2009-2010 atrazine averages*

HUC	Atrazine
101	0.88
102	1.46
103	0.17
104	0.62
105	1.26
106	1.08
107	4.03
108	0.27
201	2.26
202	2.46
203	2.64
204	4.79
205	2.00
301	3.36
302	3.83
303	3.84
304	3.23
305	1.26

*Sites are identified by HUC, which are labeled on Map 3.

TABLE 11 | 2015-2017 atrazine averages*

Site Number	Atrazine (ppb)
2	0.13
3	0.16
4	0.17
5	0.58
6	0.29
7	0.32
8	0.29
10	0.40
11	0.23
12	1.21
14	0.19
15	1.54
16	1.01
18	0.73

*Two outliers were discarded due to being above the detection limit. These were 14.63 ppb at site 4 and 77.51 ppb at site 14.

2015-2017 averages separated into high and low flow

Nitrate (NO_3): Site 10 had the highest average nitrate (NO_3) during high flow events, followed by sites 6, 7, 5, and 4 (Figure 5). High flow average nitrate (NO_3) exceeded the target of 4.4 mg/L of nitrate (NO_3) at all of these sites, as well as sites 11 and 14.

Site 14 had the highest average nitrate (NO_3) during low flow events, followed by sites 5 and 6. Low flow average nitrate (NO_3) exceeded the target at these three sites.

Load duration curves and time series plots for nitrate results were created for some sample sites. Two time series plots are included here for Site 3. USGS stream gauge data was used to create the plots. Site 3 is the only site in the watershed located near a gauge. It is located upstream of Gauge 03274650, Whitewater River near Economy, IN. A time series plot for the Economy gauge is included (Figure 6), as well as a time series plot of the gauge located near Alpine, IN (Gauge 03275000) (Figure 7). The Alpine gauge is located downstream the West Fork Watershed. The plot shows a correlation between the size of the nitrate load and flow (i.e. rainfall), suggesting that rainfall is the primary driver of nitrate load. The similarity of both plots show that it would be feasible to use data from the Alpine gauge for all sample sites in the future.

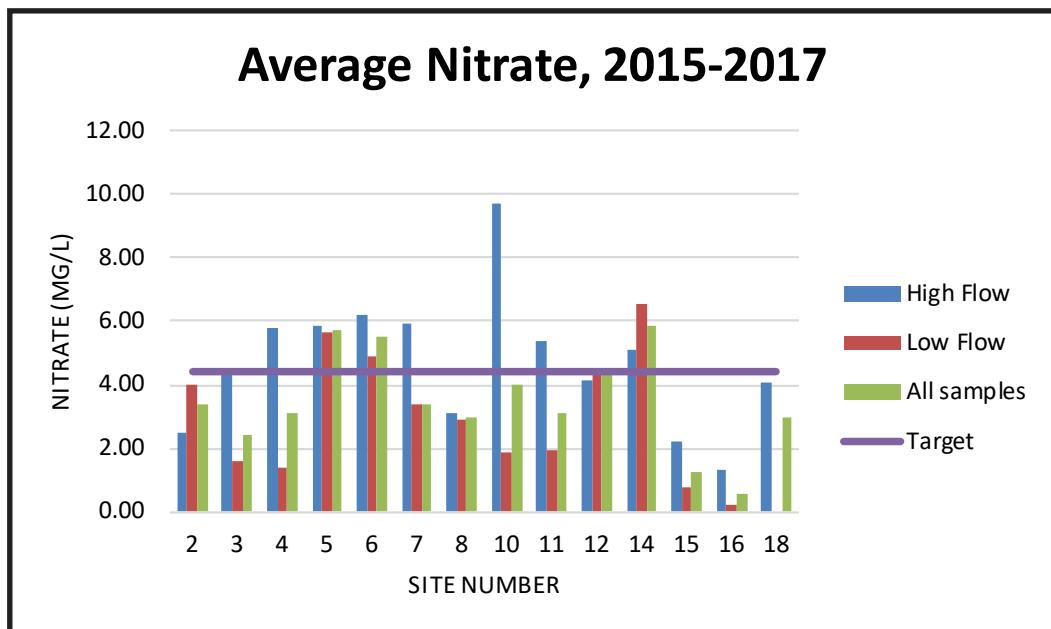


FIGURE 5 | Average nitrate during 2015-2017, separated by flow

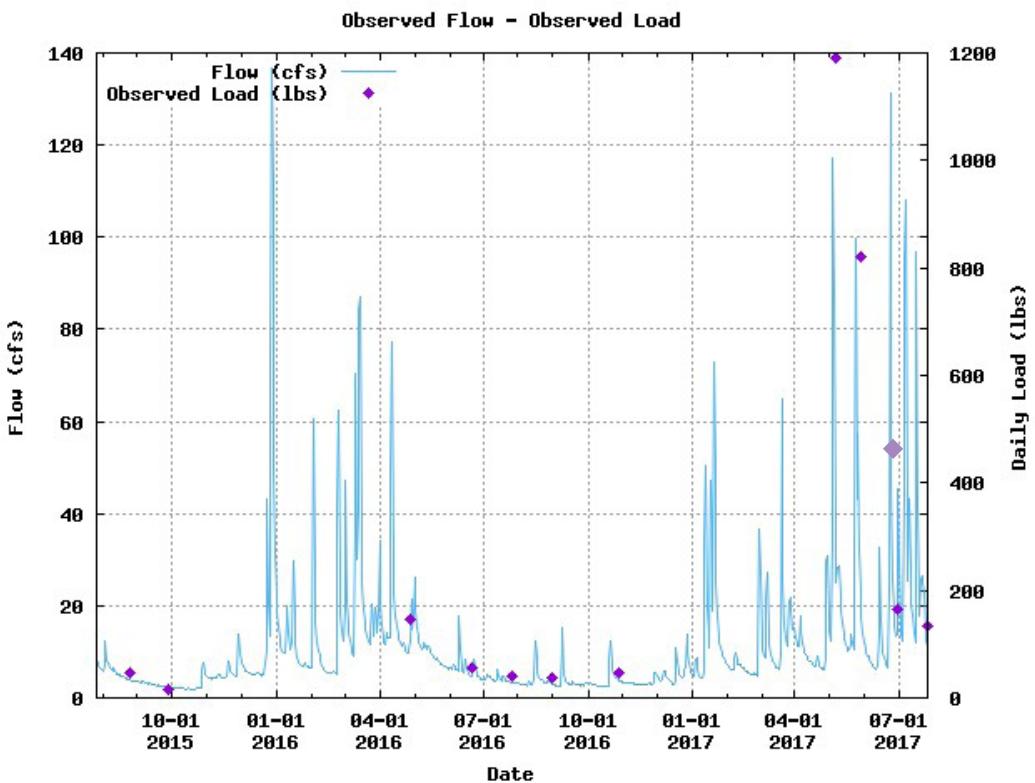


FIGURE 6 | Time series plot for daily nitrate load using Alpine gauge data

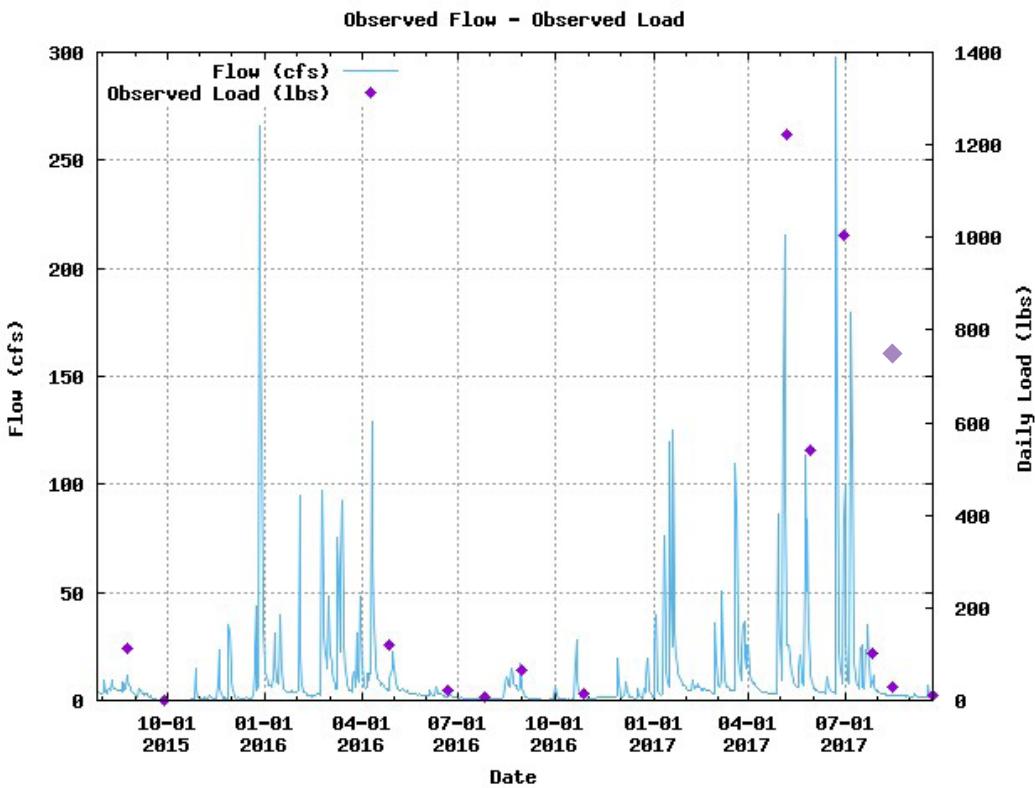


FIGURE 7 | Time series plot for daily nitrate load using Economy gauge data

Orthophosphate: Site 3 had the highest average orthophosphate during high flow events, which was 1.07 times the target concentration (Figure 8). It was the only site whose high flow average exceeded the target.

Site 15 had the highest average orthophosphate during low flow events, which was 1.5 times the target concentration. It was the only site whose high flow average exceeded the target.

Sites 6, 7, 11, 15, and 18 had average orthophosphate that was higher during low flow conditions than high flow conditions, suggesting that non-point sources may be contributing orthophosphate to surface waters.

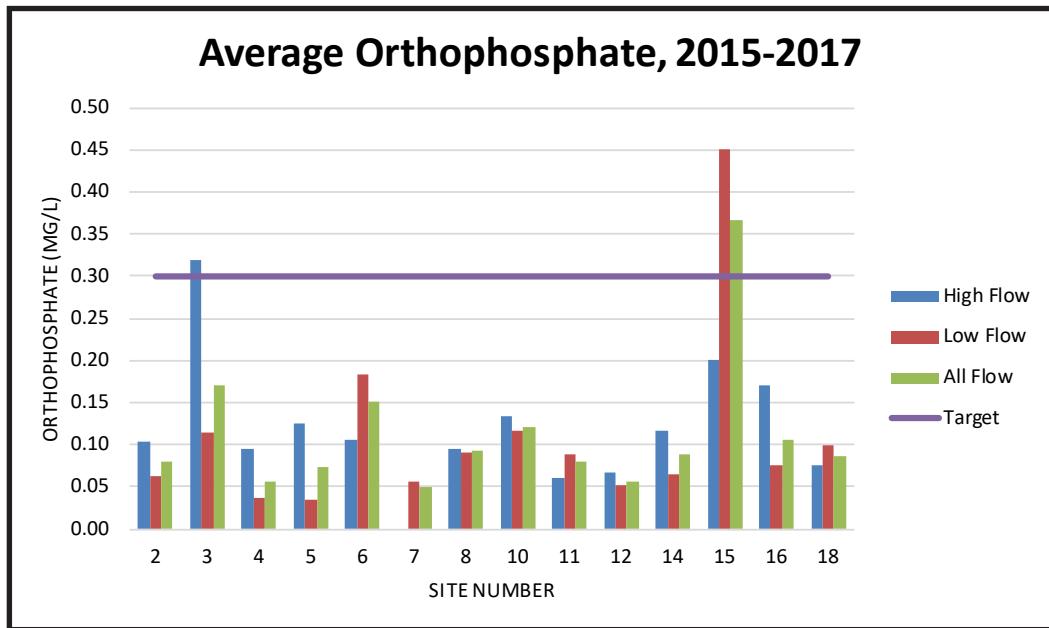


FIGURE 8 | Average orthophosphate during 2015-2017, separated by flow

Turbidity: Average turbidity at most sites was below the target of 10.4 NTU. Site 2 had the highest average turbidity during high flow events, which was 9.59 times the target concentration. Only sites 2 and 3 exceeded the target during high flow events.

Sites 7 and 10 had highest average turbidity during low flow events. Averages at both sites were 1.28 times the target concentration.

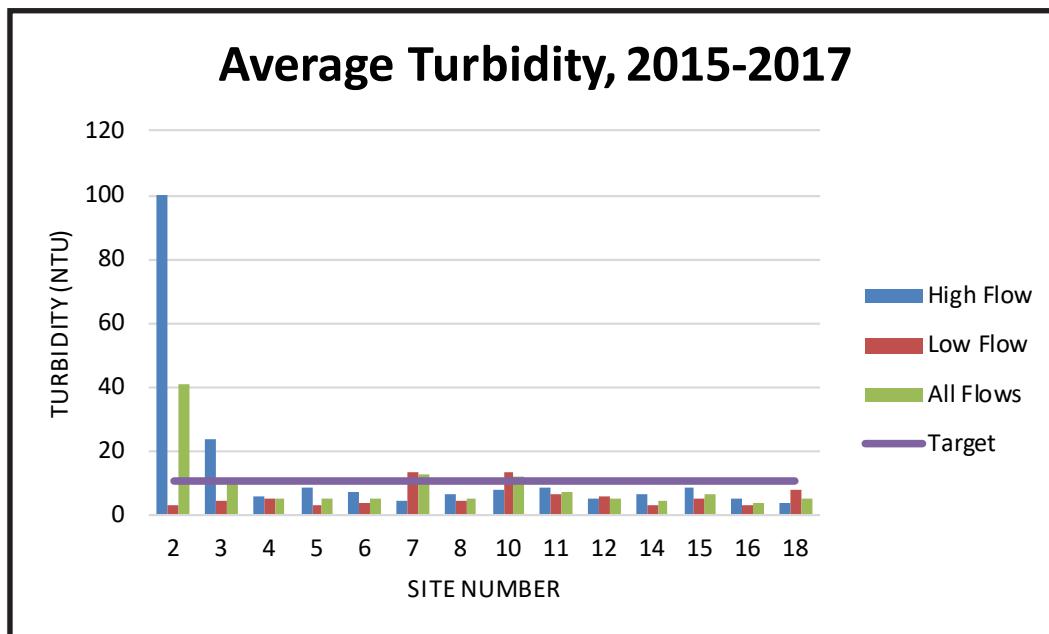


FIGURE 9 | Average turbidity during 2015-2017, separated by flow

E. coli: The geometric mean (geomean) of *E. coli* for all sites was plotted for each year (2015, 2016, 2017). In 2015, the geomean at all sites exceeded the State standard of 125 cfu/100mL (Figure 10). Sites 2, 3, and 6 had the highest geomeans. In 2016, the geomean at all sites except for site 10 exceeded the State standard (Figure 11). Sites 12, 2, and 3 had the highest geomeans. In 2017, the geomean at all sites except for sites 7, 10 and 14 exceeded the State standard (Figure 12). Sites 11, 2, and 3 had the highest geomeans. Sites 2 and 3 exceeded the State standard for the geomean of *E. coli* all three years of sampling (2015, 2016, 2017) (Figure 13).

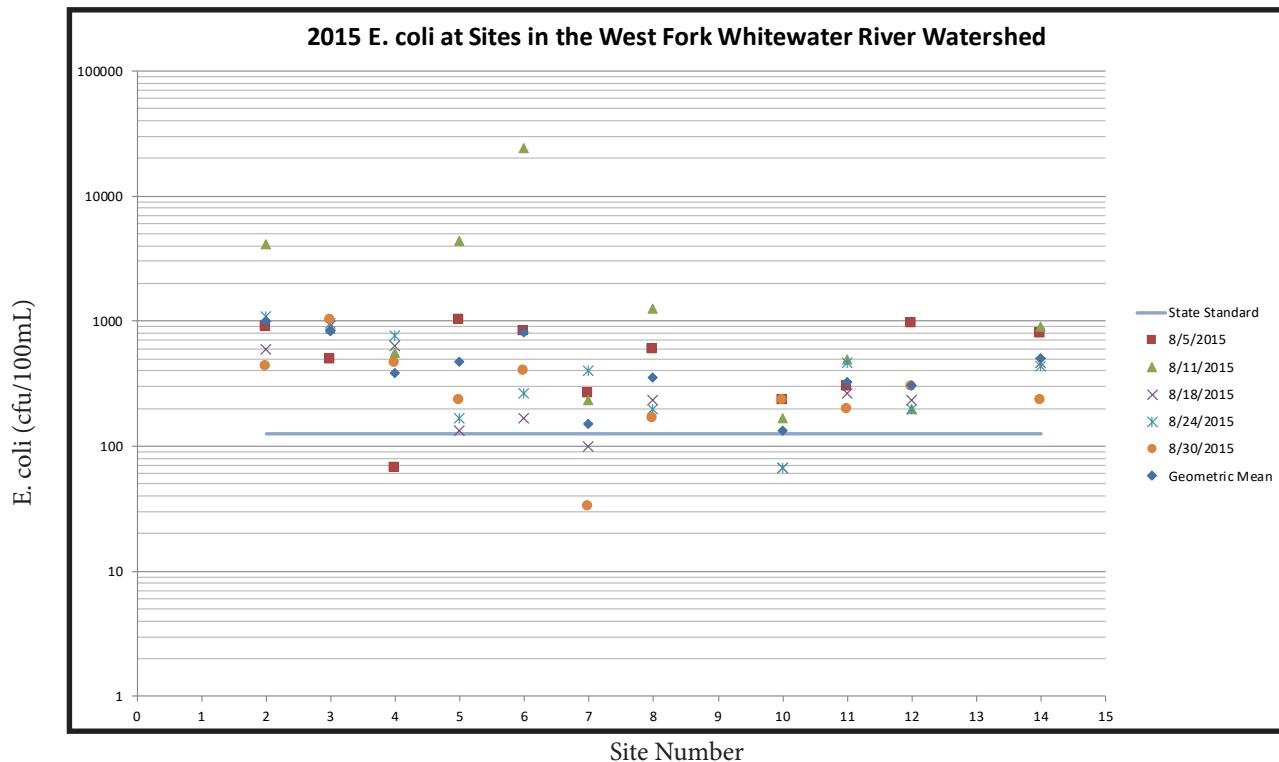


FIGURE 10 | Geometric mean of *E. coli*, 2015

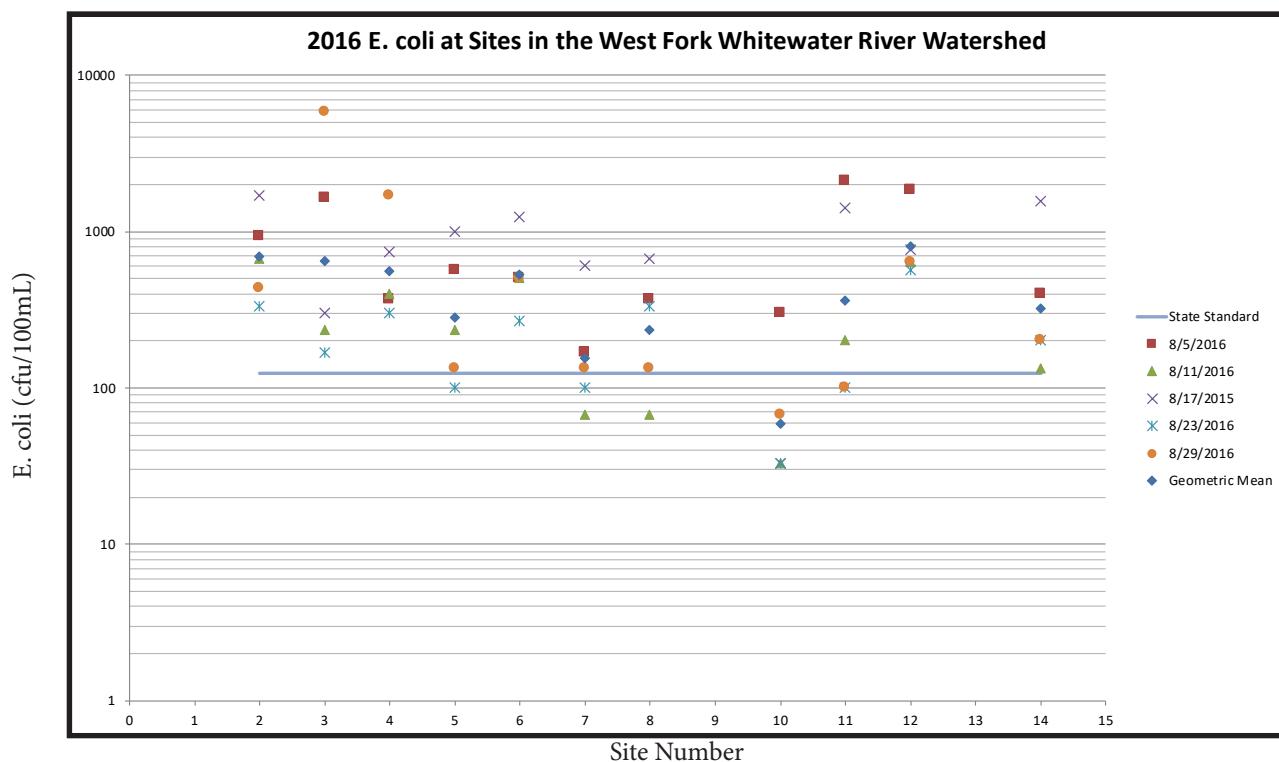


FIGURE 11 | Geometric mean of *E. coli*, 2016

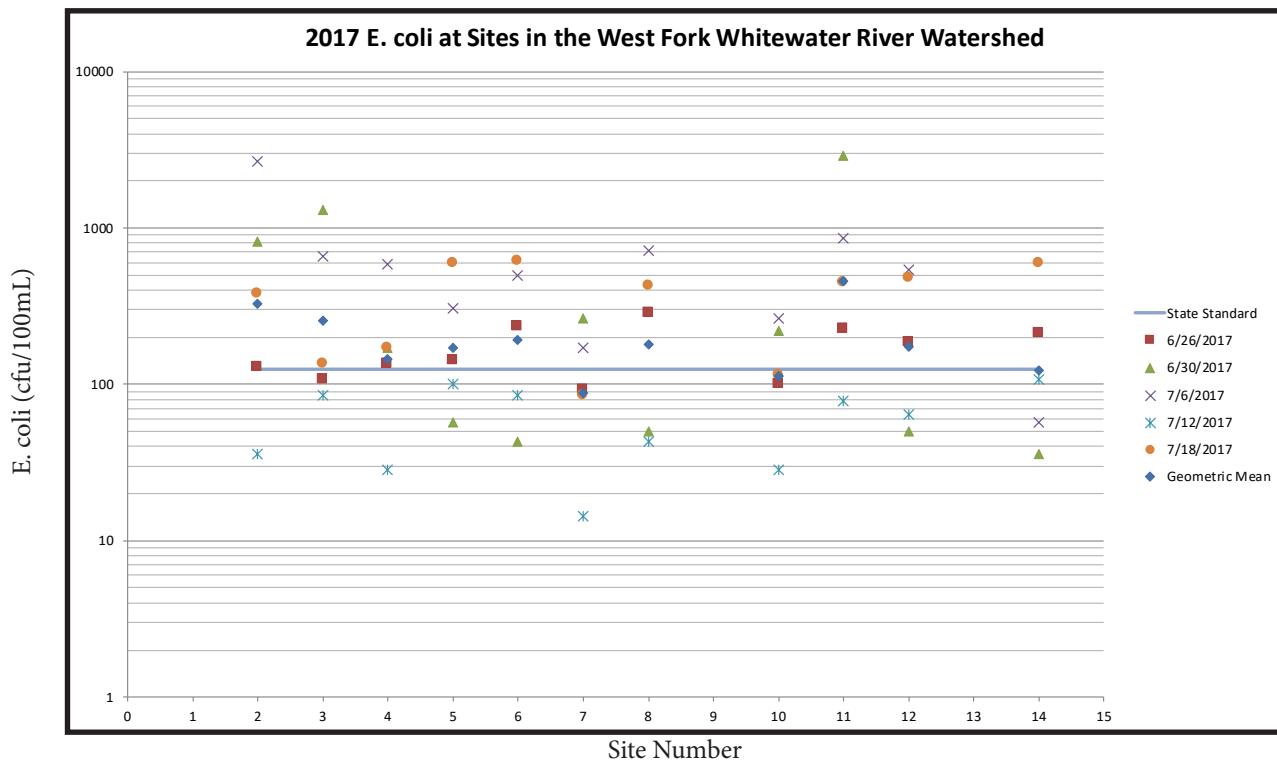


FIGURE 12 | Geometric mean of E. coli, 2015

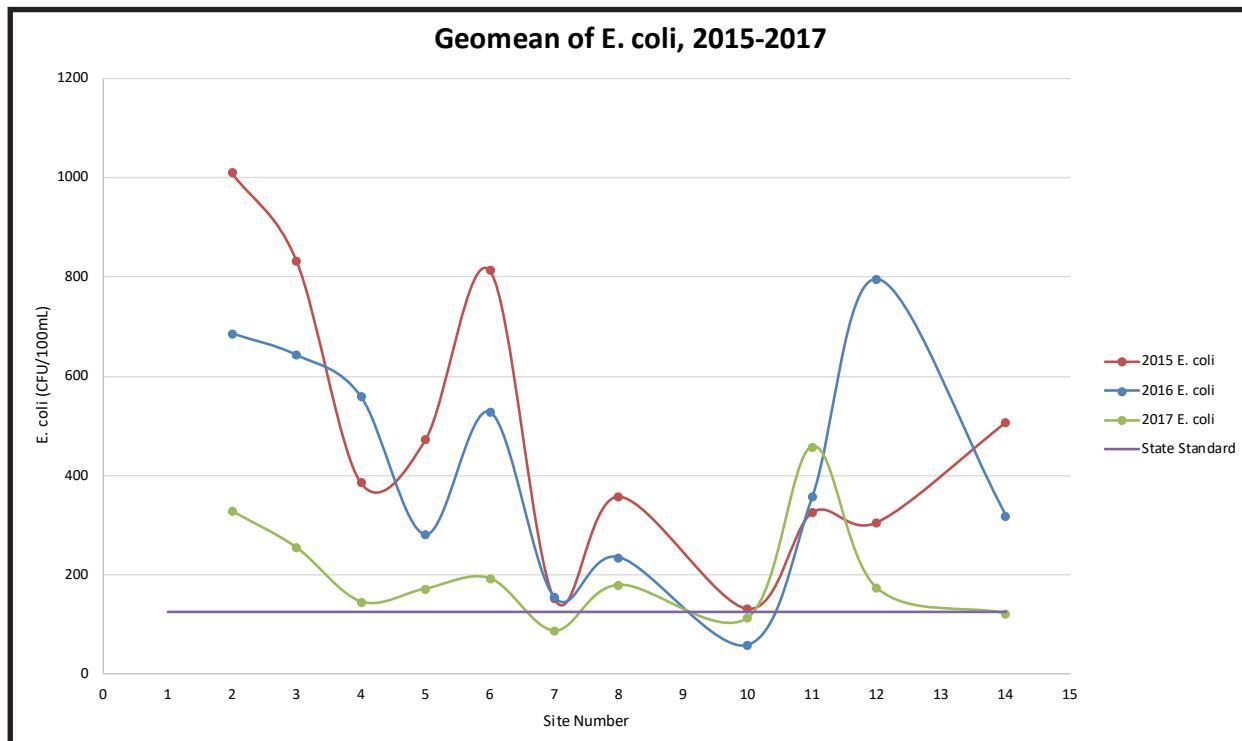


FIGURE 13 | Geometric mean of E. coli, 2015-2017

Dissolved Oxygen: At almost all sampling events, dissolved oxygen fell within the range specified in the State standards (Figures 14 and 15). Exceedances occurred at only 5 sites, one time each. Site 4, 6, 8, and 14 exceeded the max in October, 2017. Site 10 was below the minimum in Sept, 2017.

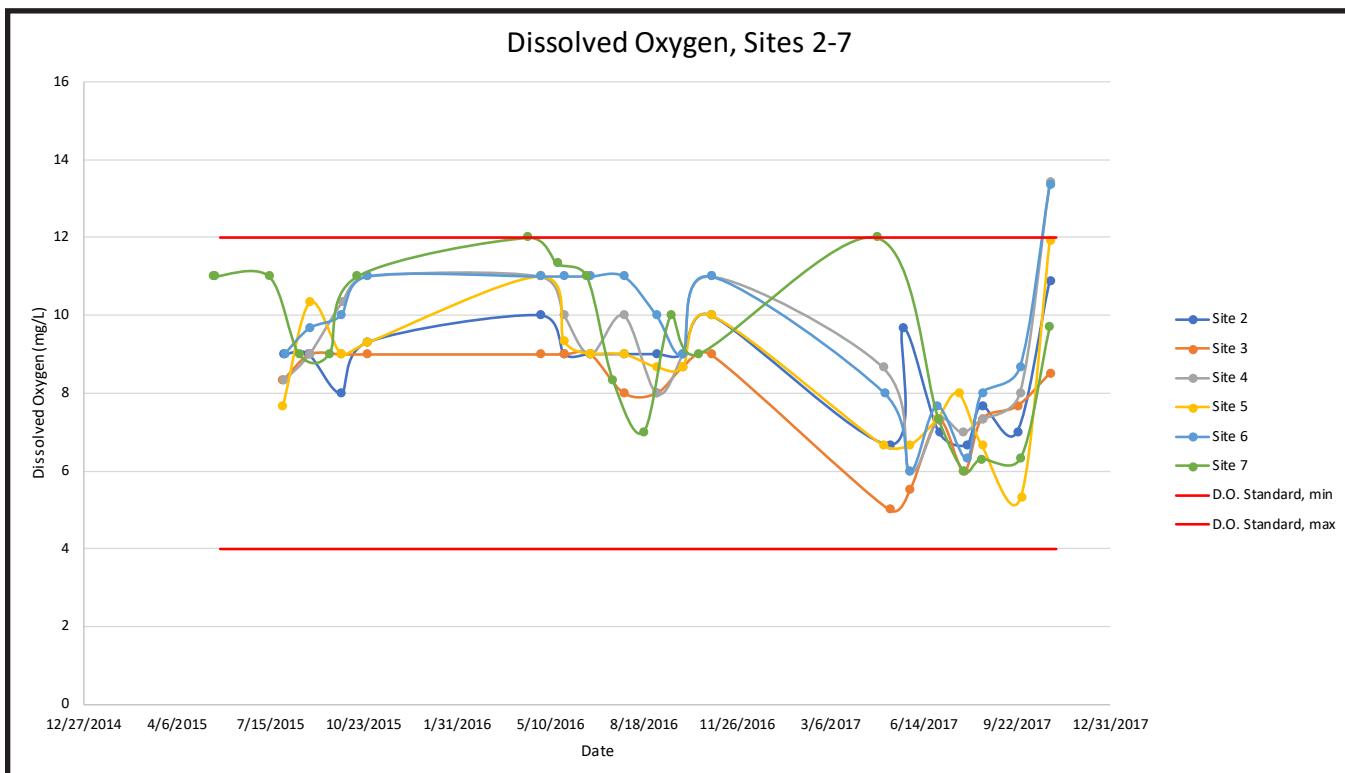


FIGURE 14 | Measured dissolved oxygen from 2015-2017, sites 2-7

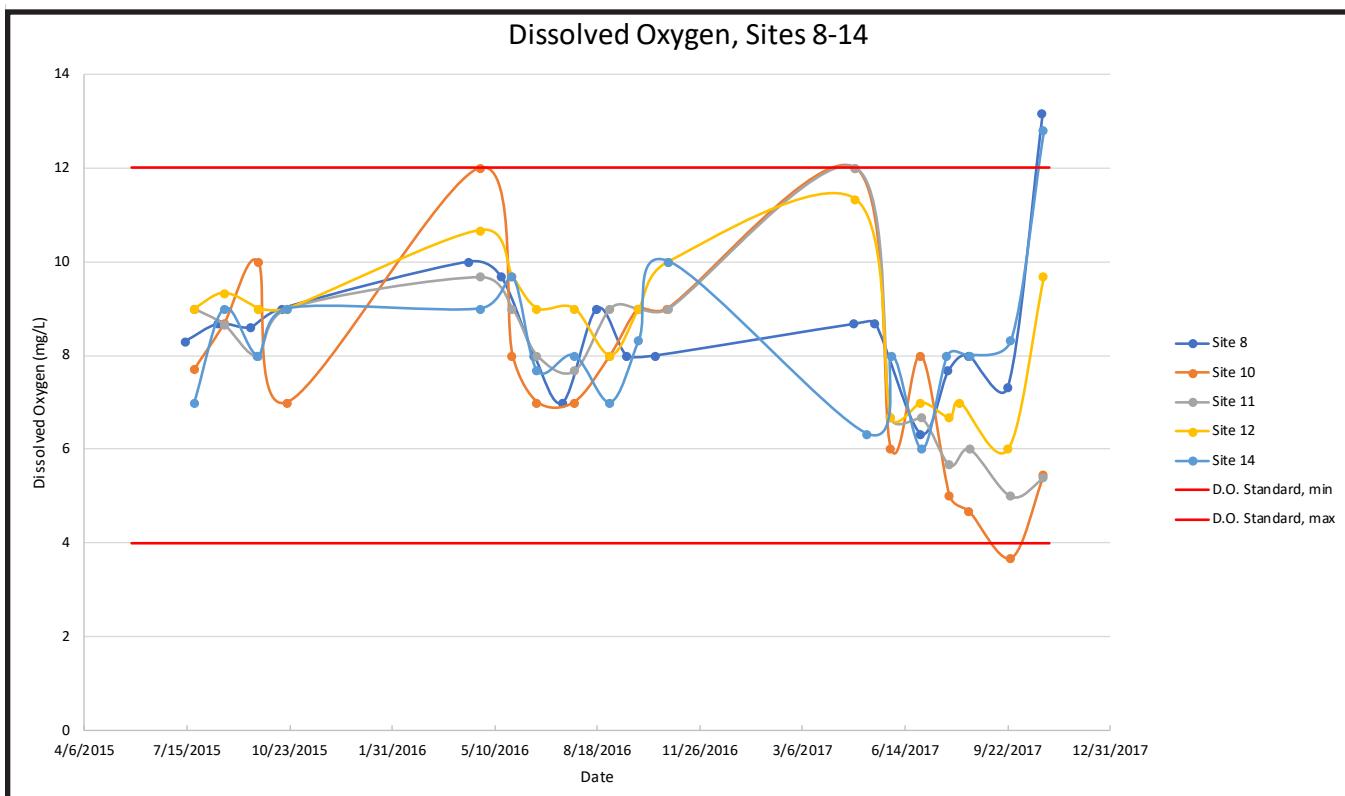


FIGURE 15 | Measured dissolved oxygen from 2015-2017, sites 8-14

Citizens Qualitative Habitat Evaluation Index (CQHEI): A set of ranges for Excellent, Good, Fair, and Poor have not been developed for this index. However, scores greater than 100 indicate exceptional high-quality habitat. Scores greater than 60 are thought to be “generally conducive to the existence of warmwater fauna.” Most sites sampled had scores greater than 60. Sites 5 and 8 had the highest scores, with both receiving a score greater than 100 once during the sampling period (Figures 16 and 17). Sites 7 and 10 had scores below 60 on several occasions and site 11 had a score below 60 once during the sampling period.

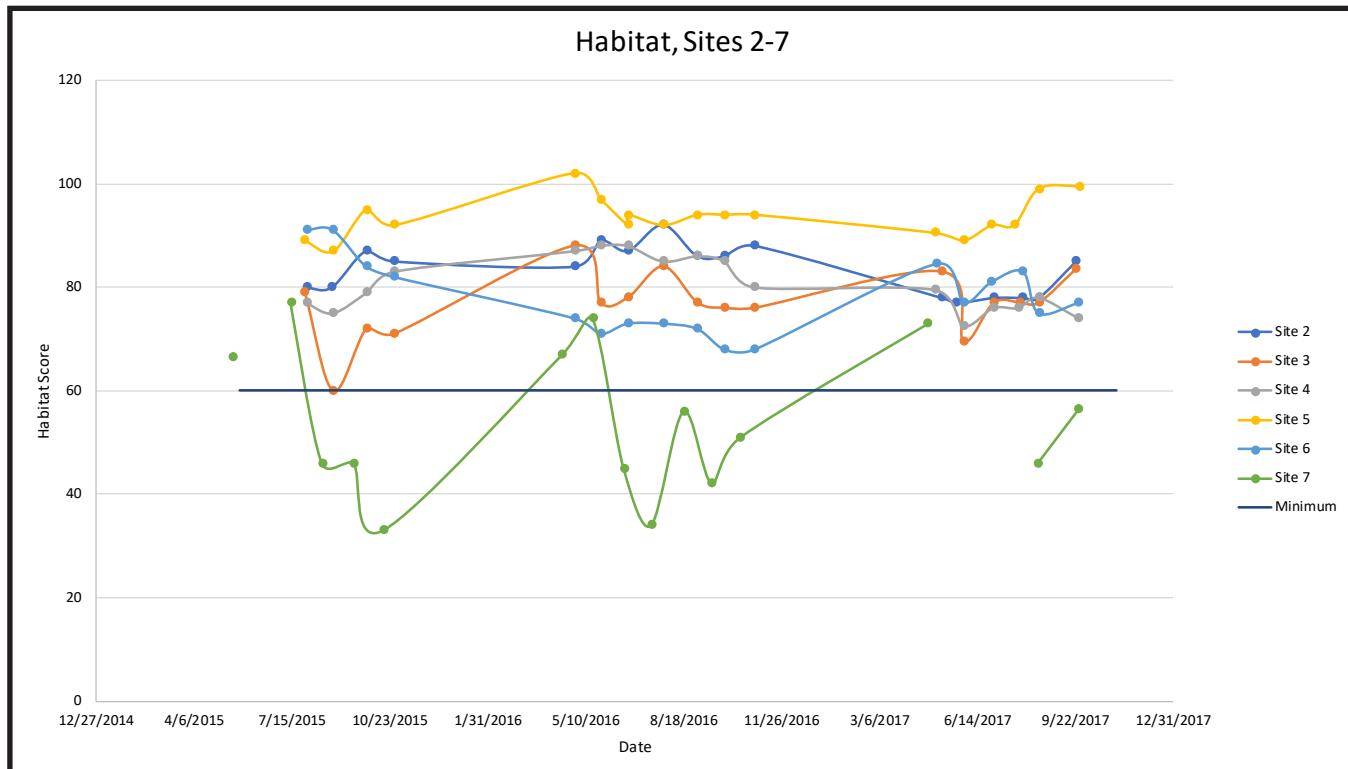


FIGURE 16 | Habitat scores from 2015-2017, sites 2-7

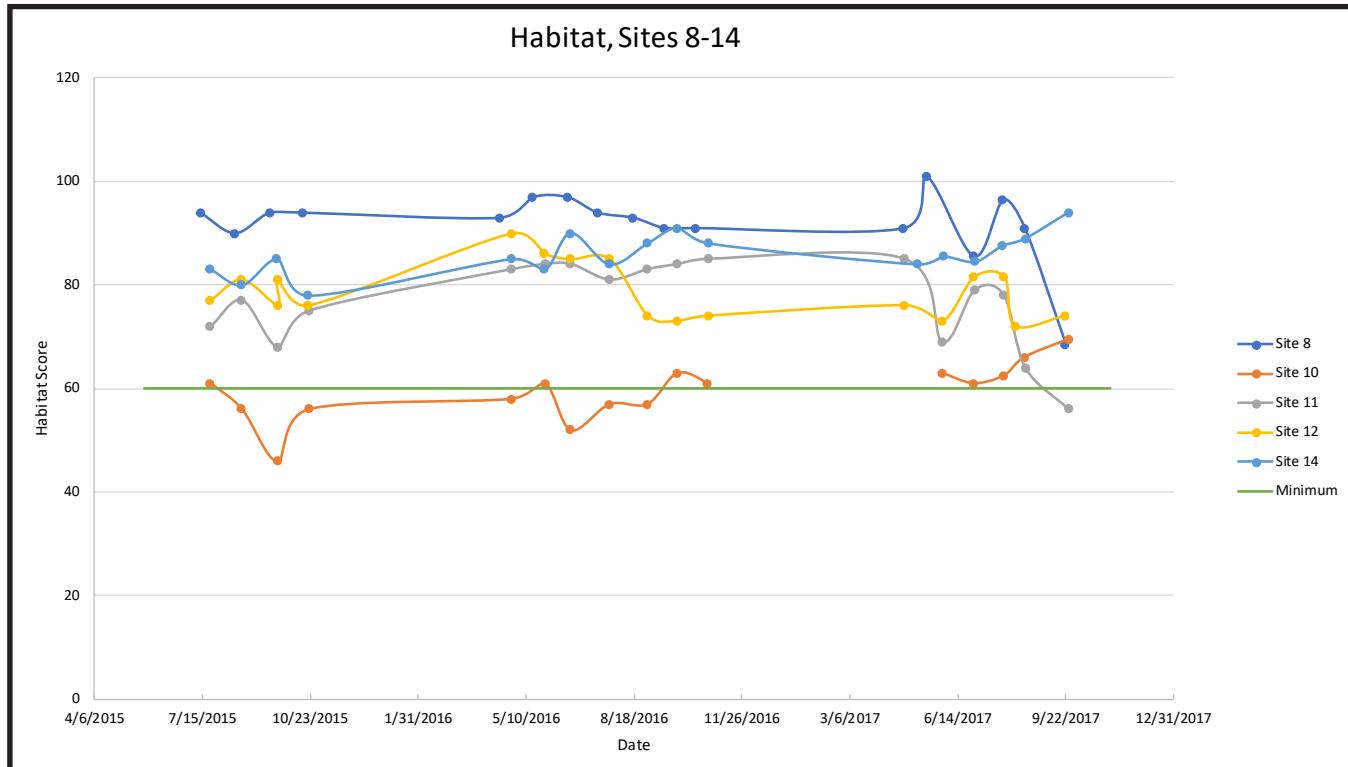


FIGURE 17 | Habitat scores from 2015-2017, sites 8-14

Pollution Tolerance Index (PTI): Benthic macroinvertebrates can be an indicator of water quality. The PTI was developed to indicate levels of pollution based on the types of benthic macroinvertebrates found at site. PTI ratings are as follows: Excellent--23 or more, Good--17 to 22, Fair--11 to 16, and Poor--10 or less. Most sites had scores of Good or Excellent (Figure 18). Site 6 was the only site with a score of Poor, measured in 2016; in 2017 its score was Fair. All other sites with scores of Fair also had a score of Good in the alternate year with the exception of Site 10, which had a score of Fair both years. Habitat scores were also low at site 10, indicating that lack of quality habitat may be limiting the aquatic life at this site. Habitat scores at site 6 are considered generally conducive to warmwater fauna, indicating that other factors, such as pollution, may be limiting the aquatic life at this site.

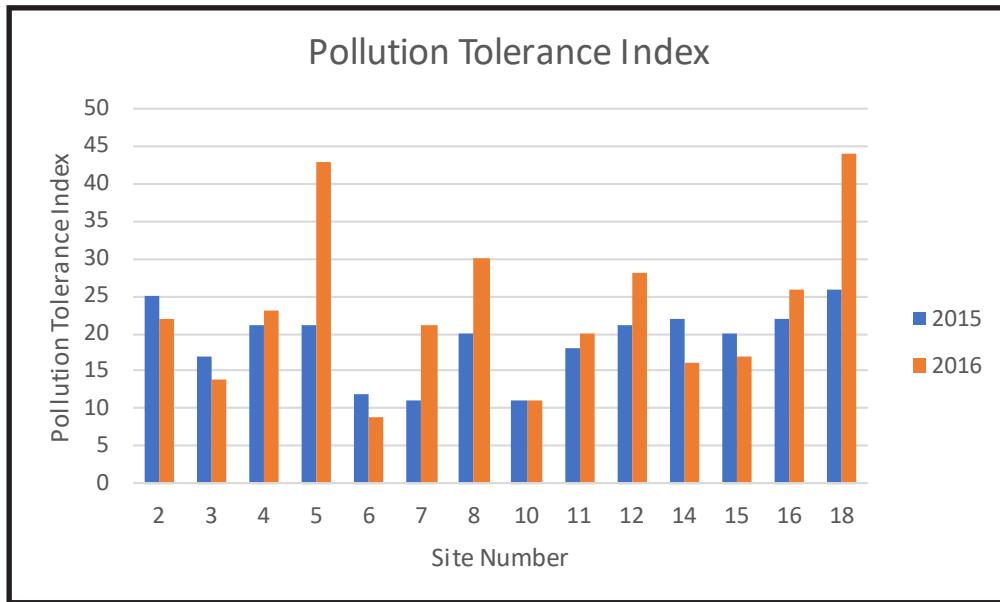


FIGURE 18 | Pollution tolerance scores measured in 2015 and 2016



During the three year period of this 319 Grant the different Watershed Coordinators have participated in a multitude of events. We had booths at the Earlham Wellness Fair and Earth Day where we had visuals and information about watersheds and how you can help protect our rivers and a healthy watershed. We also had events like the Middle Fork Reservoir and the West Fork River Cleanups where we collected things that ranged from trash to a metal bed frame. We also had a Tox-A-Way Day where the public was able to dispose their household hazardous waste for free. Sixty-six people brought waste to Tox-A-Way day. Lastly, the Watershed Coordinator and the Wayne County SWCD organized Field Days that covered various topics. Field Days included Cover Crop Field Day, River Field Day, Pasture and Livestock Field Day, Forestry and Wildlife Field Day and the Conservation Farming Workshop. A total of one hundred and sixty-seven (167) people attended field days, two thousand, seven hundred and seventy-nine people (2,779) attended education events, and three thousand, eight hundred and eighty-five people (3,885) received information about water quality protection.

Several members of the community volunteered throughout the project. There were a total of 26 volunteers that participated in the storm drain labeling events. These volunteers included students of Earlham College, Hagerstown 4H Club, and other Wayne County residents. These projects were done in 6 different towns within the watershed: Greens Fork, Centerville, Hagerstown, Fountain City, Milton, and Cambridge City. Plastic storm drain markers were used rather than paint and stenciling. Three hundred and ten (310) storm drains were labeled. Fourteen (14) steering committee members volunteered there time by attending quarterly meetings throughout the three years of the project. One (1) volunteer helped conduct water monitoring on two occasions. Six (6) volunteers participated in the West Fork Whitewater River clean-up. More than a dozen (12) volunteers participated in the Middle Fork Reservoir Cleanup.

Watershed coordinators worked with twenty-three (23) landowners to implement over 50 cost-share projects in the West Fork of the Whitewater River Watershed. Cost share projects included Cover Crops, Fence, Forage and Biomass Planting, Heavy Use Area Protection, Nutrient Management Plan, Watering Facilities, and Livestock Pipeline. Twenty-seven (27) applicants interested in receiving cost-share were turned away because there were not enough funds to provide cost-share for all projects.

The Watershed Coordinator and the Soil and Water Conservation District were able to organize a Septic Voucher Program that allowed Wayne County residents a \$50 rebate for pumping out their septic systems. The rebates were a result of donations made during the 2015 Wayne County Foundation Challenge Match. Two owners of septic service companies were sent written letters by the SWCD District Coordinator; the letters asked for donations to the campaign so that more matching funds could be obtained from the Wayne County Foundation. \$2,500 had to be donated before the Wayne County Foundation would match dollar for dollar. The match limit was \$5,000. The septic service companies had benefited from a past septic pumping voucher program organized by the Wayne Co. SWCD in 2010. We were able to help 35 homeowners with the cost of pumping their septic systems. This is important because we reduced the likelihood of those septic systems becoming faulty and impacting our streams and rivers.



PARTNERSHIPS

Several entities were helpful throughout the course of this project. The West Fork Whitewater River Steering Committee lent its time reviewing applications, providing guidance and feedback, contacting potential volunteers, and much, much more. The Wayne County SWCD and NRCS were invaluable throughout the process. They helped by answering phone calls, processing applications, designing structural practices for landowners, promoting the project at events, conducting site visits, and much more. Wayne County FSA staff provided assistance with identifying farm and tract numbers. The Wayne County Highway Department contributed technical advice and supplies for the storm drain labeling project. The New Paris Pike Landfill was a partner in the Tox-A-Way Day events, and allowed the event to be held on their site. The Wayne County Foundation's Challenge Match allowed us to raise funds for Tox-A-Way Day and the septic voucher program. Numerous donors from the community contributed moneys during the Challenge Match. Earlham College and Hagerstown High School donated the use of their space for meetings. Ball Brothers Foundation made a generous donation to fund match for administration of the project and match for cost-share. Indiana American Water tested water samples for atrazine.

Thank you to all of the partners who helped make this project a success:

West Fork Whitewater River Steering Committee

Wayne County SWCD staff

Wayne County NRCS staff

Wayne County FSA staff

Indiana American Water

Ball Brothers Foundation

Wayne County Foundation

Wayne County Highway Department

Earlham College

New Paris Pike Landfill

Hagerstown High School



MORE CHALLENGES & LESSONS

In addition to the challenges and lessons listed throughout this final report, there were four additional challenges that are described here. These challenges include a lack of funding/health insurance, Watershed Coordinator turnover, a delay in spending cost-share funds, and unmet volunteer expectations. The lessons learned as a result of facing these challenges are also described.

Lack of Funding/Health Insurance

From a previous Watershed Coordinator: “One of the biggest problems is high turnover of the Watershed Coordinator position. Part of this is due to the lack of benefits for this position. I would advise that in the future that the Watershed Coordinator position get paid more so people can afford their insurance. If this position is able to do that the Soil and Water Conservation Districts will not have as hard of a time filling and keeping this position for the long term. If benefits are not an issue people with families and more experienced employees will be interested in this position, and in turn you will get better service and more stability in this position. The Wayne County Soil and Water Conservation District sees this as a problem and is asking the Wayne County Government if they are willing to pay for benefits for this position.”

Watershed Coordinator Turnover

Transitioning into this project was difficult for FLR. Although former Watershed Coordinators were fairly well organized, it was almost inevitable that there would be questions and missing information. Not all of the water quality data had been entered into Excel and the Hoosier Riverwatch. This underscores the need to keep things as up to date as possible throughout the entire process.

Delay in Spending Cost-Share Funds

Aside from turnover of the Watershed Coordinator, the delay in spending cost-share funds caused challenges. It was necessary to request a 6 month contract extension for the project from IDEM in order to be able to complete it. Although most project requirements were completed on schedule, the cost-share program was not. We would advise that groups make a concerted effort to complete most of their cost-share spending in the first two years of their contract to avoid not being finished with the project by the project deadline. It would be better to have more potential cost-share projects than can be funded than to have too few potential cost-share projects. In the case that the demand for cost-share exceeds the cost-share funds, other sources of funding, such as Clean Water Indiana and Lake and River Enhancement Funds can be sought.

Unmet Volunteer Expectations

From a previous Watershed Coordinator: “One component that was challenging is getting volunteers to do water quality testing. I think in the future we should get the local schools in the Whitewater River Watershed and the general public more involved in water quality testing. It would be great if we had landowners go out there and be able to collect more data from different test sites to paint a better picture of the condition of the rivers and streams in the watershed. In order to do this I think in the future we need to get the word out about Hoosier Riverwatch.”



FUTURE ACTIVITY

The Wayne County SWCD plans to continue to implement the West Fork Whitewater Watershed WMP. The SWCD is continuing to apply for funding for best management practices as well as continuing educational activities and water quality and environmental improvement projects. The SWCD recognizes that there is still a high amount of interest in receiving cost-share in the area. In 2018, twenty-seven (27) applicants for this 319 project were turned away because there were not enough funds to provide cost-share for all projects.

In January 2018, the Wayne County SWCD applied for a 2018-2019 Indiana Department of Natural Resources (DNR) Lake and River Enhancement (LARE) Watershed Land Treatment Grant. The grant application requested \$38,490 to fund a cost-share program for cover crops, livestock exclusion fencing, livestock watering facilities, and other best management practices.

The Wayne County SWCD also looks to collaborate with other SWCDs in the region on water quality improvement grants. An application to fund a collaborative grant-seeking and educational partnership was recently submitted to a local foundation by the Grant County SWCD. If the grant is awarded, it will help support this regional SWCD cooperative in seeking Clean Water Indiana (CWI), DNR, and IDEM funds in the future. Encouragingly, CWI is particularly supportive of multi-county SWCDs grant applications.

The Wayne County SWCD continues to encourage and educate the public to improve water quality. They continue to hold the Tox-A-Way day event as well as free e-waste recycling days. They also continue to hold workshops and field days, as well as much more.

Introduction

A 319 Grant was awarded to the Wayne County Soil & Water Conservation District (SWCD), on October of 2014, to reduce non-point source water pollutants. The grant is responsible for funding the West Fork of the Whitewater River Watershed Initiative for Implementing Best Management Practices (BMP's) to generate better water quality in the West Fork of the Whitewater River Watershed.

The Review Process

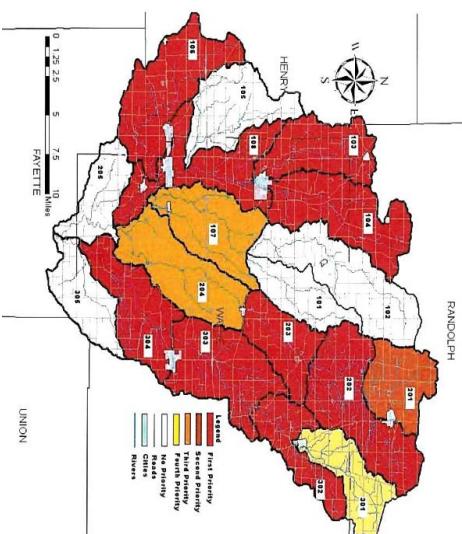
The cost share program will use the following review process:
Watershed Coordinator and Wayne County Conservation Office technical staff will work with the landowner to complete the Eligibility Application and the Cost-Share Application.

The Watershed Coordinator receives application to ensure it is complete and eligible.

The Watershed Coordinator works with Technical Committee to prioritize applications. Applications will be rated according to the West Fork Cost-Share Ranking Sheet.

The Highest ranking projects will receive funds first.

Money will be awarded after the Best Management Practices are implemented.



Wayne County SWCD
823 Round Barn Road
Richmond, IN 47374

The West Fork Watershed Cost-Share Program



Sponsored by:
The Whitewater Watershed Initiative & Wayne County Soil and Water Conservation District

Appendix A: Cost-Share Brochure

Cost Share Best Management Practices (BMPs)

Problems	Practice Code	Best Management Practice	Percent Cost-Share	Maximum Amount Cost-share Cap
Erosion, Nutrients	327	Conservation Cover	75%	Up to \$5,000
Erosion, Nutrients	340	Cover Crop	75%	Up to \$5,000 not to exceed \$45 per acre
Erosion	342	Critical Area Planting	75%	Up to \$5,000
Livestock	382	Fence	75%	Up to \$5,000
Erosion, Nutrients	386	Field Border	75%	Up to \$5,000
Erosion, Nutrients	393	Filter Strip	75%	Up to \$5,000
Erosion, Nutrients	512	Forage and Biomass Planting	75%	Up to \$5,000 not to exceed \$162/acre
Erosion, Nutrients	412	Grassed Waterways or Outlet	75%	Up to \$5,000
Livestock	561	Heavy Use Area Protection	75%	Up to \$5,000
Erosion	468	Lined Waterways or Outlet	75%	Up to \$5,000
Erosion	484	Mulching	75%	Up to \$5,000
Nutrients	590	Nutrient Management Plan	75%	Up to \$5,000
Livestock	516	Pipeline	75%	Up to \$5,000
Livestock	528	Prescribed Grazing	75%	Up to \$5,000
Erosion, Atrazine, Nutrients	391	Riparian Forest Buffer	75%	Up to \$10,000 not to exceed \$767/acre
Livestock	574	Spring Development	75%	Up to \$5,000
Erosion, Nutrients	612	Tree Shrub Establishment	75%	Up to \$5,000
Livestock	614	Watering Facility	75%	Up to \$5,000

Cost-Share BMPs Legalities

Not to exceed NRCS guidelines. AFO must have a CNMP in place to be considered for Cost-Share. CAFO cannot be a part of the NPDES to be eligible for the Cost-Share Program.

The maximum cap of Cost-share money that an individual can receive is \$10,000. If permits are required the landowner is required to pay the total permit fee. Sales tax cannot be reimbursed or cost shared.

Maintenance of Best Management Plans

The cost share recipient is responsible for maintaining the BMP after implementation. Vegetation and land management practices will be maintained for 5 years. Cover crops are maintained for only a year, but you can reapply for three years. Structural Practices will be maintained for 10 years. If the BMP was destroyed or damaged by extreme natural events (i.e., flooding, drought, lightening, etc.) it may be repaired or replaced with 319 funding during the 319 project grant term, if funds are available.

What is not eligible for Cost-Share Funding?

1. Dredging, Drainage, or Flood Control
2. Work required by regulations or permits, such as NPDES Permit
3. Permit Fees of any type
4. Sales Tax
5. Incentive Payments
6. Land Payments
7. Equipment for individuals
8. Yield Losses

More information about BMP's and the Cost-Share Program

If interested or acquire more information go to www.waynecountyswcd.org/ or call the Soil & Water Conservation District office at (765)966-0191 X3 (109)

Why Maintain Your Septic System?

There are many important reasons for maintaining your septic system. One reason is money. It typically cost \$3,000 to \$10,000 to replace a failing septic system, compared to \$100 to \$300 per year to have a septic system routinely pumped or inspected ("Maintaining Your Septic System-A Guide for Homeowners," 1). Another reason is that a faulty septic tank can harm your family and the environment ("Maintaining Your Septic System-A Guide for Homeowners," 1). A faulty septic system can contaminate your drinking water and possibly other surface waters like rivers and lakes. Finally it can keep or maintain the value of your house ("Maintaining Your Septic System-A Guide for Homeowners," 1).



What Can You Do to Help Your Septic Live a Long and Healthy Life?

- Know where your septic tank and drain field are located.
- Have your septic system inspected annually.

- Have your septic tank pumped out by a licensed contractor every three to five years, or any time you feel fit.
- Call a professional when you experience any problems.
- Conserve water to avoid loading the system.

- **Never go down into a septic tank. The gasses in the septic tanks can kill you!**

- There will be odors or persistent wet spots over the drainage field.
- The plumbing becomes sluggish over a period of time or when it is used heavily, or during wet months.
- Problems persist even though the tank has been pumped recently
- The septic tank is flooded.
- Don't allow anybody to park or drive over any part of the system.
- Don't plant anything but grass over or near the drain field.
- Don't dig or put any hard surface such as concrete and asphalt over your drain field.
- Don't make or allow repairs to your septic system without obtaining the required health department permit.
- Don't use septic tank additives it may harm your septic system.
- Don't use your toilet as a trash can?
- Don't dump poison or other chemicals in your toilet it may kill the bacteria in your septic tank.
- Use limited amounts of antibacterial soaps it can kill the microbes in the septic tank.
- Don't allow backwash from home water softeners to enter the septic system.



When Should You Pump Your Septic Tank?

Below, is a table that advises you when to pump your septic tank based on the size of your tank and the number of people that are in your house.

Tank Size (gals.)	Household Size (number of people)					
	1	2	3	4	5	6
500	5.8	2.6	1.5	1.0	0.7	0.4
750	9.1	4.2	2.6	1.8	1.3	1.0
900	11.0	5.2	3.3	2.3	1.7	1.3
1000	12.4	5.9	3.7	2.6	2.0	1.5
1250	15.6	7.5	4.8	3.4	2.6	2.0
1500	18.9	9.1	5.9	4.2	3.3	2.6
1750	22.1	10.7	6.9	5.0	3.9	3.1
2000	25.4	12.4	8.0	5.9	4.5	3.7
2250	28.6	14.0	9.1	6.7	5.2	4.2
2500	31.9	15.6	10.2	7.5	5.9	4.8

Conclusion

If you are experiencing any of these warning signs or have any concerns with your septic system, please call a professional in your area or your County Health Department.

Citation

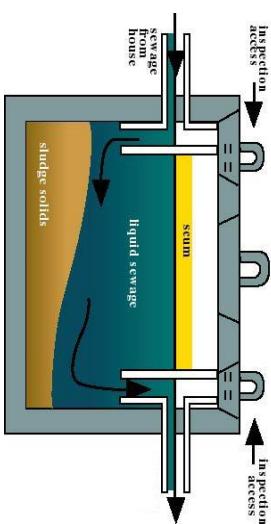
Brooks, Kenneth N., and Peter F. Follott. 2013. *Hydrology and the Management of Watersheds*. Fourth Edition. 4th ed. Ames, Iowa: Wiley-Blackwell, 190-191. Print.
"Maintaining Your Septic System-A Guide for Homeowners." Pipeline Small Community Wastewater Issues Explained to the Public 15.4 (2004): 1-7. National Environmental Service Center. Web.

Introduction

A septic system is an important piece of infrastructure for your home, but it is not a real concern for most homeowners. Most people know if they have one, but do not know how to maintain their septic tank or system. A faulty septic tank or system can pose many environmental problems.

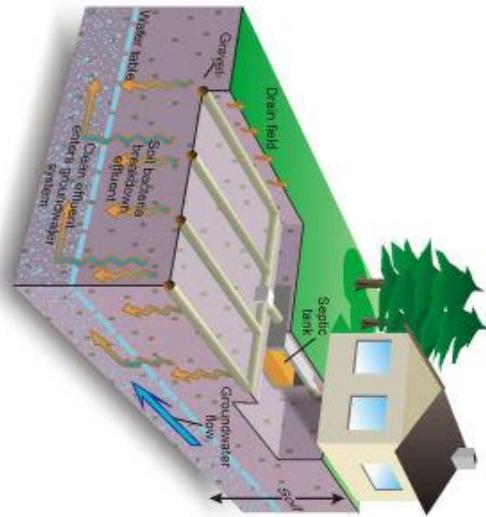
What is a Septic System?

A septic system is an onsite water treatment facility that is mainly found in rural communities. When you flush the toilet, wash dishes, or take a shower, the wastewater from the house travels into a septic tank where the solids are consumed by microbes. The solids get deposited from the wastewater into another pipe, called the effluent that goes into a distribution box and evenly transfers water through the drain field pipes and drains through slits. The type of soil is an important component of the drain field because wastewater has to be out of sight and away from people. The soil should allow the wastewater to enter and pass through the soil profile rapidly enough to avoid backups that might saturate the surface soil with wastewater, but slowly enough to allow the soil to purify the wastewater before it reaches the groundwater (Brooks and Peter, 191). The soil has to be well aerated to stimulate the microbial breakdown of the wastes and pathogens that are traveling through the soil (Brooks and Peter, 191).



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Maintaining Your Septic System



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