

# Berks Bay Action Plan (Berks BAP)



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## **INTRODUCTION AND BACKGROUND**

### **Plan Purpose**

The Pennsylvania Department of Environmental Protection (PADEP) developed the third phase of their Chesapeake Bay Watershed Implementation Plan (Ph. III WIP) in 2018. The plan requires implementation of local water quality improvements by 2025 to meet statewide pollution reduction goals. PADEP's Ph. III WIP is based on a collaborative and bottom-up clean water planning approach between the state and each county in the Chesapeake Bay drainage area. This approach gives each county flexibility to create a plan that meets local needs and is unique to the jurisdiction.

### **Plan Highlights**

The Berks Bay Action Plan (Berks BAP, or BBAP) is a summary of approaches, initiatives, and considerations for existing and proposed water quality improvements in the Chesapeake Bay drainage areas of the county. There are two distinct areas within the county that drain to the Chesapeake Bay and are generally referred to as the Little Swatara area (northwest areas of the county) and the Conestoga-Cocalico area (southwest areas). A Watersheds Map outlining these watersheds and the Chesapeake Bay drainage areas of Berks County is located in the appendix.

The Berks BAP in conjunction with state efforts aims to ultimately reduce approximately 620,000 pounds of nitrogen and 21,000 pounds of phosphorus annually to local streams and water resources through BMPs implemented by 2025. Current efforts and opportunities have identified approaches that will result in approximately 246,000 pounds of Nitrogen reductions (~40% of the target) and 19,000 pounds of Phosphorus reductions (~90% of the target) annually.

The Berks BAP is a dynamic and adaptive plan summarizing approaches and tracking implementation efforts for local water quality improvements. The plan is aspirational but realistic. However, objectives of the BBAP are tied to an overall mission of building an inventory of existing uncaptured/unreported BMPs and locations of opportunities for future BMP implementation with the intent to better understand and define the most appropriate BMP implementation scenario. In other words, the identified actions of BBAP initiatives are intended to result in a revised BMP implementation scenario in 2023 with higher confidence (and again in 2025). The BBAP will be updated on an annual basis and reports will be provided to both local stakeholders and PADEP through 2025 summarizing progress towards identified long-term goals or adjustments to overall approaches. Key goals and objectives of the Berks BAP are:

- Act as the implementation arm of 319 WIP planning efforts in the Little Swatara and Upper Conestoga areas.
- Complement existing programs and efforts (countywide MS4 education, Source Water Protection plan, RCPP, etc.).
- Balance theoretical reductions with real-world conservation needs and improvements.
- Action Teams focused on the Little Swatara region, Conestoga-Cocalico region, and Coordination.

- Prioritization and implementation steps driven by assessments of individual catchments (Catchment Management Database and Targeting) and one-on-one engagements.
- Initiate implementation steps and development of game plans identified under priority initiatives during the last quarter of 2021.

### **Key Findings**

Success of the Berks BAP implementation process will be dependent upon a combination of funding, regulatory flexibility, innovative techniques, and political will coming together. Key actions and considerations for that led development and proposed for successful implementation include:

- Partnering with existing/proposed 319 WIP development steering committees in the Upper Little Swatara and Upper Conestoga River watersheds.
- It is necessary to complement existing programs and plans in lieu of competing or recreating the wheel.
- Strong GIS capabilities and knowledge, which will assist with analyses and prioritization efforts.
- Initial BMP implementation goals are a mix of underreported BMPs to be captured and long-term possible BMP implementation rates (BMP reconciliation).
- Success is highly predicated on financial/funding assistance and permitting flexibility. Funding and resource gaps were identified for the following:
  - \$67,500 for catchment assessments actions
  - \$120,000/year for 2 additional persons for PracticeKeeper (PK) data entry, data management, and long-term verification processes
  - ~\$21.9 million - \$33.2 million for BMP implementation (design, engineering, and construction)
  - Currently unknown values for long-term maintenance activities
- A methodical data capture and opportunities identification exercise (Catchment Targeting Initiative) is necessary to balance BMP reconciliation and conservation needs identification efforts.
- The Coordination Priority Initiative identified a game plan for Action 3.1 (Catchment Assessments and Prioritization). This game plan and subsequent actions forms the baseline technical analyses required to achieve the objectives of the BBAP.

### **Opportunities for Success**

Berks BAP development included the identification of appropriate collaborations, priority areas, and funding needs specific to Berks County that would improve implementation success while providing extended benefits to the community. Opportunities and considerations that will improve success of implementation include:

- Partnering with the Upper Little Swatara 319 WIP Plan development process and Steering Committee.
- Engaging with the proposed Upper Conestoga 319 WIP Plan development process, and ultimately partnering with the group for Upper Conestoga areas of the county.

- One-on-one engagements with farmers and the agricultural community is absolutely critical for long-term success.
- Municipal communications via the county-wide MS4 education group to build individual municipal relationships.
- Long-term funding for “boots-on-the-ground” engagements/assessments and BMP implementation.
- Focusing efforts to complement the approximate \$1 million RCPP funding for the next five years.
- Ensuring initial prioritization efforts align with goals and objectives of previous and existing plans (e.g. countywide Source Water Protection Plan).
- Capturing underreported BMPs while simultaneously realizing implementation of new BMPs.
- Assigned leads amongst BCCD, County Planning, and County Dept. of Agriculture Land (DoAL) for important actions and tasks necessary for BBAP implementation tracking.
- Partnering with neighboring counties to align and complement efforts.

### **Challenges**

Several opportunities for success and overall Berks BAP implementation will inherently encounter challenges. How these challenges unfold will determine the level of successful implementation by 2025. Primary hurdles and challenges anticipated or known include:

- Funding for BMP implementation and limited resources in general
- Long-term verification processes
- Permitting timelines and flexibility
- Capacity and conflicting requirements for data management, data entry, and related considerations
- Farmer resistance, buy-in, and commitments (especially with land use BMPs such as riparian buffers)
- Tight timeline for significant BMP implementation
- Capturing underreported BMPs previously implemented
- Act 38 plans into PracticeKeeper
- Programmatic hurdles, timelines, or conflicting requirements

## **INITIATIVES**

### **Summary**

The Berks BAP includes actions and goals to guide the county’s clean water efforts for the next several years. These are included in the Planning and Progress Templates and the State Programmatic Recommendations. For ease of review, the Priority Initiatives and Action Items they include are summarized below.

**Priority Initiative 1: Little Swatara Region**

- Action 1.1 Upper Little Swatara 319 Plan development and implementation
- Action 1.2 One-on-one farmer engagements via Catchment Management Database (CMD) prioritization
- Action 1.3 One-on-one municipal engagements
- Action 1.4 Regional partnerships
- Action 1.5 Promote and monitor BMP implementation

**Priority Initiative 2: Conestoga-Cocalico Region**

- Action 2.1 Upper Conestoga 319 Plan development and implementation
- Action 2.2 One-on-one farmer engagements via CMD prioritization
- Action 2.3 One-on-one municipal engagements
- Action 2.4 Regional partnerships
- Action 2.5 Promote and monitor BMP implementation

**Priority Initiative 3: Coordination**

- Action 3.1 Catchments prioritization (Catchment Targeting Initiative)
- Action 3.2 Promote and monitor ag BMP implementation
  - Soil Conservation and WQ Plans – 14,809 total acres
  - Nutrient Management Core Nitrogen – 12,608 total acres
  - Nutrient Management Core Phosphorus – 5,436 total acres
  - Nutrient Management Placement Nitrogen – 3,400 new acres
  - Nutrient Management Timing Nitrogen – 3,800 new acres
  - Nutrient Management Rate Nitrogen – 2,700 new acres
  - Nutrient Management Placement Phosphorus – 2,700 new acres
  - Nutrient Management Timing Phosphorus – 2,700 new acres
  - Nutrient Management Rate Phosphorus – 2,700 new acres
  - Conservation Tillage – 6,145 total acres/year
  - High Residue Tillage – 6,600 total acres/year
  - Traditional Cover Crops – 4,714 total acres/year
  - Cover Crops with Fall Nutrients – 4,500 total acres/year
  - Commodity Cover Crops – 550 total acres/year
  - Prescribed Grazing – 717 total acres
  - Pasture Alternative Watering – 400 total acres
  - Horse Pasture Management – 20 total acres
  - Barnyard Runoff Controls/Loafing Lot Management – 4 new acres
  - Dairy Precision Feeding – 2,300 animal units
  - Animal Waste Management Systems – 6,320 new animal units
  - Manure Transport out of Berks County – 2,000 dry tons/year
  - Manure Incorporation – 700 acres
  - Poultry Mortality Composting – 2 systems
- Action 3.3 Promote and monitor urban/developed BMP implementation
  - Runoff Reduction Performance Standards – 400 new acres treated
  - Stormwater Treatment Performance Standards – 200 new acres treated

- Extended Dry Ponds – 50 new acres treated
- Infiltration Practices – 40 new acres treated
- Bioretention – 25 new acres treated
- Vegetated Open Channels – 25 new acres treated
- Impervious Disconnection – 0.24 acres
- Advanced IDD&E Control – 140 acres treated
- Conservation Landscaping – 40 new acres
- Urban Tree Canopy – 1 new acre
- Urban Forest Planting – 10 new acres
- Urban Nutrient Management – 650 acres
- Septic Denitrification – 150 systems
- Septic System Pumping – 300 systems
- Septic Connections – 75 total systems
- Action 3.4 Promote and monitor riparian buffers and stream BMP implementation
  - Forest buffers – 300 new acres
  - Forest buffers with exclusion fencing – 50 new acres
  - Narrow forest buffers with exclusion fencing – 50 new acres
  - Grass Buffers – 300 new acres
  - Grass Buffers with exclusion fencing – 10 new acres
  - Narrow grass buffers with exclusion fencing – 10 new acres
  - Urban forest buffers – 20 new acres
  - Urban stream restoration – 1,500 new linear feet
  - Non-urban stream restoration – 3,500 new linear feet
  - Wetland restoration – 28 total acres
  - Wetland creation – 12 total acres
  - Dirt & Gravel Road Program (Driving Surf. + Roadbed) – 750 new linear feet
- Action 3.5 Promote and monitor conservation/preservation BMP implementation
  - Forest Conservation – 293 acres
  - Agricultural Conservation – 492 acres
  - Wetland Conservation – 15 acres
- Action 3.6 Data management
- Action 3.7 Programs/plans alignment
- Action 3.8 BMP Reporting Reconciliation

### **Programmatic/Policy Recommendations**

Berks County stakeholders identified a set of initial actions necessary to reduce policy and programmatic hurdles for implementation of certain BMPs or supporting activities identified in the BBAP:

- Item 1.1 Increase funding for personnel, projects, etc. for Berks BAP implementation
  - Establish BBAP implementation support funding for workforce expansion, equipment, and BMP implementation.
- Item 1.2 Expand cover crops definition

- Create a cover crops classification that allows the application of fall nutrients and is harvested in the spring
- Item 1.3 BMP reconciliation parameters
  - Establish a list of the minimum parameters and attributes that should be noted when underreported Ch. 102/land development BMPs are captured.
  - Establish a reporting mechanism(s) for captured Ch. 102/land development BMPs.
- Item 1.4 Establish a clear set of directions and parameters for PracticeKeeper (PK) data entry
  - Establish a clear Standard Operating Procedure (SOP) or similar document for PK data entry that balances NRCS's privacy policies and PADEP reporting policies.
- Item 1.5 BMP Quick Reference Guide update
  - Expand the BMP Quick Reference Guide to include descriptions, requirements, etc. of all BMPs credited in CAST/Bay model.
- Item 1.6 Transfer of information from NRCS generated Soil Conservation Plans into PK platform
- Item 1.7 Mushroom composting definition
  - Create a separate definition (or a sub-category of existing manure composting definitions) specific to mushroom composting.
- Item 1.8 Livestock in streams
  - Establish a consistent policy as it relates to livestock in streams.
- Item 1.9 Accelerated permitting for Berks BAP identified projects of regional importance
  - Provide arena and processes for accelerating permitting requirements for priority projects.

### **Priority Initiatives Detail**

The Berks BAP Priority Initiatives are centered around a set of considerations, focus areas, and actions intended to directly and indirectly support the implementation of BMPs across the Chesapeake Bay drainage areas of the county. The plan includes a Catchment Management Database (CMD). The CMD is the foundational platform to prioritize catchment targeting efforts and capture findings.

Development of the Berks BAP was guided by a Management Team. An organizational chart was developed that reflects relationships between the groups involved with development and ultimately with implementation of the plan.

### **PRIORITY INITIATIVE 1: Little Swatara Region**

- Description
  - The Center for Watershed Protection (CWP) has organized and is leading an effort in partnership with BCCD for the development of a 319 Plan for the Little Swatara watershed in the northwest area of the county. A partnership has been established with CWP, the Steering Committee, and extended partners to



engage during plan development and ultimately assist and/or apply BBAP resources towards the 319 Plan implementation.

- See Priority Initiative 1 (Little Swatara) planning template in the Reporting and Support Documents section for more information and details.
- Focus Areas
  - Little Swatara watershed
- Actions
  - Action 1.1 Upper Little Swatara 319 Plan development and implementation
    - Participate in and support 319 plan development led by CWP in partnership with BCCD.
    - Carry over plan opportunities and initiatives into Berks BAP implementation activities (BMP implementation inventory, etc.)
    - Lead: BCCD
  - Action 1.2 One-on-one farmer engagements via CMD prioritization
    - Provide Berks BAP resources to augment or complement 319 plan development outreach activities with the farming community.
    - Co-Leads: BCCD and County DoAL
  - Action 1.3 One-on-one municipal engagements
    - Support 319 plan development efforts by providing lead engagement efforts with local municipalities in conjunction with Catchment Targeting Initiative efforts.
    - Lead: County Planning
  - Action 1.4 Regional partnerships
    - Identify and collaborate on regional partnerships in watershed areas that cross jurisdictional boundaries for funding opportunities.
  - Action 1.5 Promote and monitor BMP implementation
    - Communicate Berks BAP BMP implementation scenario goals and capture implementation efforts for reporting efforts.
- Implementation Considerations
  - Challenges
    - Funding for BMP implementation identified in the 319 Plan and through catchment assessments
    - Balancing urban/suburban considerations (handled by the BBAP team) and agricultural considerations (handled by the 319 Plan team)
    - Farmer resistance, buy-in, and commitments (especially with land use BMPs such as riparian buffers)
  - Opportunities for Success
    - Transfer and communication of findings, information, etc. captured during Catchment Targeting efforts to assist the 319 Plan Steering Committee and CWP with plan development and vice versa
    - BBAP team provides additional technical assistance to the 319 Plan development group.

- Delineating individual catchment targets will provide manageable BMP rates
- Partnerships with Lebanon County and Schuylkill County for funding applications and coordinated efforts.

**PRIORITY INITIATIVE 2: Conestoga-Cocalico Region**

- Description
  - The Chesapeake Bay Foundation (CBF) is organizing and is leading an effort in partnership with multiple regional partners (BCCD, Lancaster County Conservation District, Lancaster Farmland Trust, etc.) for the development of a 319 Plan for the Upper Conestoga watershed that includes areas in the southwest area of the county. A partnership has been established with CBF and extended partners to engage during plan development and ultimately assist and/or apply BBAP resources towards the 319 Plan implementation.
  - See Priority Initiative 2 (Conestoga-Cocalico) planning template in the Reporting and Support Documents section for more information and details.
- Focus Areas
  - Conestoga watershed (Upper Conestoga areas of Berks County)
- Actions
  - Action 2.1 Upper Conestoga 319 Plan development and implementation
    - Participate in and support 319 plan development led by CBF and regional partners.
    - Carry over plan opportunities and initiatives into Berks BAP implementation activities (BMP implementation inventory, etc.)
    - Lead: BCCD
  - Action 2.2 One-on-one farmer engagements via CMD prioritization
    - Provide Berks BAP resources to augment or complement 319 plan development outreach activities with the farming community.
    - Co-leads: BCCD, County DoAL
  - Action 2.3 One-on-one municipal engagements
    - Support 319 plan development efforts by providing lead engagement efforts with local municipalities in conjunction with Catchment Targeting Initiative efforts.
    - Lead: County Planning
  - Action 2.4 Regional partnerships
    - Identify and collaborate on regional partnerships in watershed areas that cross jurisdictional boundaries for funding opportunities.
  - Action 2.5 Promote and monitor BMP implementation
    - Communicate Berks BAP BMP implementation scenario goals and capture implementation efforts for reporting efforts.
- Implementation Considerations
  - Challenges
    - Funding for BMP implementation identified in the 319 Plan

- Balancing urban/suburban considerations (handled by the BBAP team) and agricultural considerations (handled by the 319 Plan team)
- Farmer resistance, buy-in, and commitments (especially with land use BMPs such as riparian buffers)
- Opportunities for Success
  - Transfer and communication of findings, information, etc. captured during Catchment Targeting efforts to assist the 319 Plan Steering Committee and CBF with plan development and vice versa
  - BBAP team provides additional technical assistance to the 319 Plan development group
  - Partnerships with Lancaster and Chester County for shared catchments.

### **PRIORITY INITIATIVE 3: Coordination**

- Description
  - Bay area-wide implementation support and monitoring efforts will pass through the Coordination Action Team. The team will ensure catchment areas outside of the Little Swatara region and Conestoga-Cocalico region (or areas not of focus for 319 plan(s) development) will be captured. This team will spearhead the Catchment Targeting Initiative and capture/organization of data and information.
  - A technically driven effort was identified to balance BMP reconciliation activities and the identification of conservation needs and BMP implementation opportunities. This team will guide the step-by-step activities and findings for prioritization of BMP implementation efforts on a catchment-to-catchment basis.
    - The process will include three primary steps: 1) desktop analysis that also involves cross-referencing existing plans to establish a preliminary understanding of an individual catchment (including identification of potential uncaptured BMPs and opportunities for exploration), 2) “Boots-on-the-ground” field verifications and initial outreach activities to establish a game plan for catchment, and 3) one-on-one engagements and organizational activities to capture under-reported BMPs and prioritize new BMPs for implementation.
    - It is anticipated that the 319 plan development groups for the Little Swatara and Upper Conestoga will be at the forefront of boots-on-the-ground and field verification efforts.
  - The Catchment Management Database (CMD) includes and outlines the preliminary rankings of catchment groups based on the USGS SPARROW mass loading and incremental loading data. A three-tiered hierarchy was established to grade groups and is a red-yellow-green light system (red is poor, yellow is fair/vulnerable, green is optimal).
  - Existing CAST data and information (based on 2019 progress data) was utilized to ascertain maximum acres or land available for BMP implementation (especially

for riparian buffers-based on stream miles/feet identified in the bay drainage areas of the county).

- It was assumed a certain portion (~50%) of stream miles are already buffered (high level desktop aerial analysis) and a certain portion of remaining areas can be buffered.
    - See Priority Initiative 3 (Coordination) planning template in the Reporting and Support Documents section for more information and details.
  - Focus Areas
    - All 27 catchment groups of the Chesapeake Bay drainage areas of Berks County
    - Collaboration and data/information sharing for areas where 319 plan development is underway or will be in the near future
  - Actions
    - Action 3.1 Catchments prioritization (Catchment Targeting Initiative)
      - Desktop and field analyses of organized catchment groups followed by “boots-on-the-ground” activities intended to identify status of BMPs in place, conservation needs, and BMP opportunities.
      - Lead: County Planning
    - Action 3.2 Promote and monitor ag BMP implementation
      - Lead: BCCD
      - Soil Conservation and WQ Plans – 14,809 total acres
        - *Plans are a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Plans must meet technical standards.*
      - Nutrient Management Core Nitrogen – 12,068 total acres
        - *Applications of nitrogen are made in accordance with certain elements as applicable (e.g. land-grant university recommendations, spreader calibration, manure analysis, etc.) and technical standards*
      - Nutrient Management Core Phosphorus – 5,436 total acres
        - *Applications of phosphorus are made in accordance with certain elements as applicable (e.g. land-grant university recommendations, spreader calibration, manure analysis, etc.) and technical standards*
      - Nutrient Management Placement Nitrogen – 3,400 acres
        - *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice and an additional element from a list of options (e.g. Applications of inorganic nitrogen are injected into the subsurface or incorporated into the soil)*
      - Nutrient Management Timing Nitrogen – 3,800 acres

- *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice, and are split across the growing season into multiple applications*
- Nutrient Management Rate Nitrogen – 2,700 acres
  - *Applications of nitrogen are made in accordance to all elements of the Nitrogen Core practice and an additional element from a list of options (e.g. Nitrogen applications are made using variable rate goals)*
- Nutrient Management Placement Phosphorus – 2,700 acres
  - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice and an additional element from a list of options (e.g. Applications of inorganic phosphorus are injected into the subsurface or incorporated into the soil)*
- Nutrient Management Timing Phosphorus – 2,700 acres
  - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice, and are split across the growing season into multiple applications*
- Nutrient Management Rate Phosphorus – 2,700 acres
  - *Applications of phosphorus are made in accordance to all elements of the Phosphorus Core practice and an additional element from a list of options (e.g. Phosphorus applications are made using variable rate goals)*
- Conservation Tillage – 6,145 total acres/year
  - *A conservation tillage routine that involves the planting, growing and harvesting of crops with minimal disturbance to the soil in an effort to maintain 30 to 59 percent crop residue coverage immediately after planting each crop.*
- High Residue Tillage – 6,600 total acres/year
  - *A conservation tillage routine that involves the planting, growing and harvesting of crops with minimal disturbance to the soil in an effort to maintain at least 60 percent crop residue coverage immediately after planting each crop.*
- Traditional Cover Crops – 4,714 total acres/year
  - *A short-term crop grown after the main cropping season to reduce nutrient losses to ground and surface water by sequestering nutrients. This type of cover crop may not receive nutrients in the fall and may not be harvested in the spring.*
- Cover Crops with Fall Nutrients – 4,500 total acres/year
  - *A short-term crop grown after the main cropping season to reduce nutrient losses to ground and surface water by sequestering*

*nutrients. This type of cover crop is planted upon cropland where manure is applied following the harvest of a summer crop and prior to cover crop planting. The crop may not be harvested in the spring.*

- Commodity Cover Crops – 550 total acres/year
  - *A winter cereal crop planted for harvest in the spring which does not receive nutrient applications in the fall. Any winter cereal crop which did receive applications in the fall is not eligible for nutrient reductions.*
- Prescribed Grazing – 717 total acres
  - *This practice utilizes a range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas.*
- Pasture Alternative Watering – 400 total acres
  - *Providing a clean, convenient water source in pastures separate from surface waters.*
- Horse Pasture Management – 20 total acres
  - *This practice involves maintaining a 50% pasture cover with managed species and managing high traffic areas for horses.*
- Barnyard Runoff Controls/Loafing Lot Management – 4 new acres
  - *This includes practices such as roof runoff control, stabilization of heavy use areas, diversion of clean water from entering the barnyard and control of runoff from barnyard areas.*
- Dairy Precision Feeding – 2,300 animal units
  - *Dairy Precision Feeding reduces the quantity of phosphorus and nitrogen fed to livestock by formulating diets within 110% of Nutritional Research Council recommended level in order to minimize the excretion of nutrients without negatively affecting milk production.*
- Animal Waste Management Systems – 6,320 new animal units
  - *Any structure designed for collection, transfer and storage of manures and associated wastes generated from the confined portion of animal operations and complies with NRCS 313 (Waste Storage Facility) or NRCS 359 (Waste Treatment Lagoon) practice standards.*
- Manure Transport out of Berks County – 2,000 dry tons/year
  - *Transport of excess manure in or out of a county. Manure may be of any type—poultry, dairy, or any of the animal categories. Transport should only be reported for county to county transport*
- Manure Incorporation – 700 acres



- *Reducing impervious surfaces to promote infiltration and percolation of storm water runoff.*
- Advanced IDD&E Control – 140 acres treated
  - *Illicit discharge detection and elimination credits are only available to localities that show empirical monitoring for each eligible individual discharge.*
- Conservation Landscaping – 40 new acres
  - *The conversion of managed turf into actively maintained perennial meadows, using species that are native to the Chesapeake Bay region.*
- Urban Tree Canopy – 1 new acre
  - *Includes trees over roads and non-road impervious surfaces such as buildings and parking lots; and includes trees within 30'-80' of non-road impervious surfaces where the understory is assumed to be turf grass or otherwise altered through compaction, removal of surface organic material and/or fertilization.*
- Urban Forest Planting – 10 new acres
  - *Urban forest planning includes any tree planting except those used to establish riparian forest buffers. Trees are planted on pervious areas, and farther than 30'-80' from non-road impervious surfaces and forming contiguous patches greater than one-acre in extent.*
- Urban Nutrient Management – 650 acres
  - *The proper management of major nutrients for turf and landscape plants on a property to best protect water quality.*
- Septic Denitrification – 150 systems
  - *The septic system should employ a 50% denitrification unit for pre-treatment of waste with no enhanced in situ treatment system within the soil treatment unit. This BMP should be used only for systems that employ recirculating media filters (RMF) or integrated fixed-film activated sludge (IFAS) pre-treatment technologies, but do not employ enhanced in situ treatment systems.*
- Septic System Pumping – 300 systems
  - *Septic systems achieve nutrient reductions through several types of management practices, including frequent maintenance and pumping. On average, septic tanks need to be pumped once every three to five years to maintain effectiveness.*
- Septic Connections – 75 total systems
  - *This is when septic systems get converted to public sewer.*



- Action 3.4 Promote and monitor riparian buffers and stream BMP implementation
  - Lead: BCCD
  - Forest buffers – 300 new acres
    - *Linear wooded areas on or adjacent to crop and hay land uses that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required.*
  - Forest buffers with exclusion fencing – 50 new acres
    - *Linear wooded areas on or adjacent to pasture land uses with fencing installed to prevent livestock from grazing and trampling the buffer or entering the stream and that helps filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required.*
  - Narrow forest buffers with exclusion fencing – 50 new acres
    - *Linear wooded areas on or adjacent to pasture land uses with fencing installed to prevent livestock from grazing and trampling the buffer or entering the stream and that helps filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is at least 10 feet wide and a maximum width of 35 feet.*
  - Grass Buffers – 300 new acres
    - *Linear strips of grass or other non-woody vegetation on or adjacent to crop and hay land uses maintained to help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for buffers is 100 feet, with a 35 feet minimum width required.*
  - Grass Buffers with exclusion fencing – 10 new acres
    - *Linear strips of grass or other non-woody vegetation on or adjacent to pasture land uses with fencing installed to prevent livestock from grazing and trampling the buffer or entering the stream and is maintained to help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for buffers is 100 feet, with a 35 feet minimum width required.*
  - Narrow grass buffers with exclusion fencing – 10 new acres
    - *Linear strips of grass or other non-woody vegetation on or adjacent to pasture land uses with fencing installed to prevent livestock from grazing and trampling the buffer or entering the stream and is maintained to help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width is a at least 10 feet wide and a maximum 35 feet width required.*



- Wetland Conservation – 15 acres
          - *Conserves wetlands based on participation in state programs and land trust activities.*
  - Action 3.6 Data management
    - Co-Leads: County Planning and BCCD
    - House the master CMD and related information and inventories with County GIS.
    - House agricultural-related plans and BMPs in PracticeKeeper
    - Enter non-agricultural BMPs with no cost share and/or permits into FieldDoc
  - Action 3.7 Programs/plans alignment
    - Lead: County Planning
    - Alignment and overlay of existing and newly proposed plans with direct and/or indirect nutrient and sediment reduction actions with BBAP implementation efforts and Catchment Targeting Initiative efforts.
  - Action 3.8 BMP Reporting Reconciliation
    - Ensure applicable protocols and policies are in place to capture and inventory underreported and/or uncaptured BMPs previously implemented.
- Implementation Considerations
  - Challenges
    - Funding for BMP implementation, “boots-on-the-ground” engagements and assessments, and limited resources in general
    - Permitting flexibility
    - Long-term verification processes
    - Capacity and conflicting requirements for data management, data entry, and related considerations
    - Tight timeline for significant BMP implementation
    - Resources for timely and successful Catchment Targeting Initiative efforts
    - Programmatic hurdles, timelines, or conflicting requirements
    - Farmer resistance/buy-in for ag-related BMPs (including buffers)
  - Opportunities for Success
    - Engagement/education to be achieved via one-on-one engagements by balancing farmer’s needs and wants with fitting into a recognized BMP for nutrient and sediment reductions.
    - Municipal communications via the county-wide MS4 education group to build individual municipal relationships.
    - Focusing efforts to complement the approximate \$1 million RCPP funding for the next five years.
    - Direct transfer of NRCS plans/BMPs into BCCD PK platform
    - Ensuring initial prioritization efforts align with goals and objectives of previous and existing plans (e.g. countywide Source Water Protection Plan).

- Capturing underreported BMPs while simultaneously realizing implementation of new BMPs.
- Partnering with neighboring counties to align and complement efforts.
- Identification of land conservation opportunities during catchment analyses (forest, farmland, and wetland) and engagement of extended partners for potential easements or similar tools.
- Additional funding for added personnel for Practice Keeper management.
- Adoption of fertilizer legislation by the state assembly

## **REPORTING AND SUPPORT DOCUMENTS**

Reporting and support documents included in the Berks BAP are:

- Proposed BMPs for Implementation (“BMP Implementation Scenario”)
  - Outlines specific BMPs and total quantities proposed for implementation and delineated between the agricultural and non-agricultural (developed/other) sectors
- Initiatives Tracking Document(s) (PADEP Planning and Progress Template)
  - Summarizes Priority Initiatives in a tracking spreadsheet
  - Tracking documents include:
    - Little Swatara Region
    - Conestoga-Cocalico Region
    - Coordination
- Programmatic Recommendations Document (PADEP Programmatic Template)
  - Summarizes programmatic and/or policy change recommendations that would reduce challenges or hurdles for successful BBAP implementation.

## Berks County Agriculture Best Management Practices (BMPs) Proposed BMP Implementation Rates

Best Management Practice	Amount	Units of Measure	Percent of Total Available Acres
<b>Agriculture Compliance</b>			
Soil Conservation and Water Quality Plans	14,809	Total Acres	~81%
Nutrient Management Core N	12,068	Total Acres	~57%
Nutrient Management Core P	5,436	Total Acres	~25%
Barnyard Runoff Control	2	New Acres	~100%
Loafing Lot Management	2	New Acres	N/A
<b>Soil Health</b>			
Tillage Management-High Residue	6,600	Total Acres/Year	48%
Tillage Management-Conservation	6,145	Total Acres/Year	42%
Cover Crop Traditional	4,714	Total Acres/Year	~32%
Cover Crop Traditional with Fall Nutrients	4,500	Total Acres/Year	~32%
Cover Crop-Commodity	550	Total Acres/Year	~4%
Prescribed Grazing	717	Total Acres	~42%
Pasture Alt. Watering	400	Total Acres	~24%
Horse Pasture Management	20	Total Acres	~1%
<b>Expanded Nutrient Management</b>			
Nutrient Management N Rate	2,700	Acres	14%
Nutrient Management P Rate	2,700	Acres	14%
Nutrient Management N Placement	3,400	Acres	17%
Nutrient Management P Placement	2,700	Acres	14%
Nutrient Management N Timing	3,800	Acres	19%
Nutrient Management P Timing	2,700	Acres	14%
<b>Manure Storage Facilities</b>			
Manure Storage Facilities	6,320	New AU's	N/A
<b>Dairy Precision Feeding</b>			
Dairy Cow Precision Feed Management	2,300	Dairy Cow AU's	N/A
<b>Integrated System for Elimination of Excess</b>			
Manure Transport out of Berks County	2,000	Dry Tons/Year	N/A
Manure Incorporation	700	Acres	N/A
Poultry Mortality Composting	2	Systems	N/A
<b>Agriculture Riparian Zone</b>			
Forest Buffer	300	New Acres	N/A
Forest Buffer-Streamside with Exclusion Fencing	50	New Acres	N/A
Forest Buffer-Narrow with Exclusion Fencing	50	New Acres	N/A
Grass Buffer	300	New Acres	N/A
Grass Buffer-Streamside with Exclusion Fencing	10	New Acres	N/A
Grass Buffer-Narrow with Exclusion Fencing	10	New Acres	N/A

The agriculture BMP implementation rates provided above are a combination of the state recommendations identified in the Chesapeake Bay Phase 3 Watershed Implementation Plan (WIP), engagements with local stakeholders and agencies, and the Berks County Management Team

**Berks County Stormwater Best Management Practices (BMPs)  
Proposed BMP Implementation Rates**

Best Management Practice	Amount	Units of Measure	Percent of Total Available Acres
<b>Urban/Developed Areas Riparian Zone</b>			
MS4 Riparian Forest Buffers	5	New Acres	N/A
Non-MS4 Forest Buffers	15	New Acres	~4%
<b>Woods and Pollinator Habitat</b>			
Conservation Landscaping	40	New Acres	~<1%
Urban Forest Planting	10	New Acres	N/A
<b>Urban Tree Canopy</b>			
MS4 Urban Tree Canopy	1	New Acres	N/A
<b>Forest, Farm, and Natural Areas Conservation</b>			
Farmland Conservation	492	Total Acres	N/A
Forest Conservation	293	Total Acres	N/A
Wetland Conservation	15	Total Acres	N/A
<b>Stream and Wetland Restoration</b>			
Urban Stream Restoration	1,500	New Linear Feet	N/A
Non-urban Stream Restoration	3,500	New Linear Feet	N/A
Wetland Restoration	28	Total Acres	N/A
Wetland Creation	12	Total Acres	N/A
<b>Stormwater Control Measures</b>			
Runoff Reduction Performance Standards	400	New Acres Treated	~4%
SW Treatment Performance Standards	200	New Acres Treated	~2%
Extended Dry Ponds	50	New Acres Treated	~<1%
Infiltration Practices	40	New Acres Treated	~<1%
Bioretention/rain gardens	25	New Acres Treated	~<1%
Vegetated Open Channel	25	New Acres Treated	~<1%
<b>Control Measures for Illicit Discharges</b>			
Advanced Grey Infrastructure IDD&E Control	140	Acres Treated	2%
<b>Industrial Stormwater</b>			
Impervious Surface Reduction	0.24	Acres	N/A
<b>Fertilizer Legislation</b>			
Urban Nutrient Management	650	Acres	9%
<b>Septic Systems</b>			
Septic Denitrification-Conventional	150	Systems	N/A
Septic System Pumping	300	Systems	N/A
Septic Connections	75	Total Systems	N/A
<b>Dirt &amp; Gravel Road Program</b>			
Driving Surface + Raising the Roadbed	750	New Linear Feet	N/A

The stormwater BMP implementation rates provided above are a combination of the state recommendations identified in the Chesapeake Bay Phase 3 Watershed Implementation Plan (WIP), engagements with local stakeholders and agencies, and the Berks County Management Team.

## Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

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Action #	Description	Performance Target(s)	Responsible Party(ies) and Partnerships	Geographic Location	Expected Timeline	Potential Implementation Challenges or Recommendations	Resources Available			Resources Needed			Review Checklist Comments	
							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
<b>Priority Initiative 1: Little Swatara</b>														
1.1	Upper Little Swatara (ULS) 319 Plan Development and Implementation	<i>Summer 2022 for 319 Plan</i>	Upper Little Swatara (ULS) 319 Plan Steering Committee, Center for Watershed Protection (CWP), BCCD, NRCS, Ag Technical Service Providers (TSPs)	Upper Little Swatara (ULS) catchments	Mid 2021-mid 2022 for plan development followed by implement.	Carry over identified 319 plan opportunities and initiatives into the Berks Bay Action Plan (BBAP) and Catchment Targeting inventories  BBAP participation with 319 plan steering committee  “Leaning” on 319 Plan development as the driver for BBAP implementation in the ULS catchments	CWP, BCCD, BerksNature, County, local engineers/consultants, TSPs		Growing Greener (GG) (funding secured for 319 Plan develop.)				BMP implement. funding (as noted under Action 3.1 for implement. challenges and recom.)	
1.2	One-on-one farmer engagements via Catchment Management Database (CMD) prioritization	<i>Engagements list for each catchment per Action 3.1</i>	CWP, BCCD, NRCS, TSPs	All catchments	On-going with inherent tie to Actions 1.1 and 3.1	Augmented messaging and outreach combining 319 plan goals and objectives with BBAP action items and goals	CWP, BCCD, TSPs						Funding for expanded engagements as noted under Action 3.1	
1.3	One-on-one municipal engagements	<i>Engagements list for each catchment per Action 3.1</i>	CWP, County	All catchments	On-going with inherent tie to Actions 1.1 and 3.1	Augmented messaging and outreach combining 319 plan goals and objectives with BBAP action items and goals	BCCD, County, local engineers/consultants							

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1.4	Explore partnerships with Lebanon and Schuylkill counties for regional efforts		County, BCCD	Catchments within shared watersheds	On-going	Watershed-based, multi-entity, collaborative grant applications are viewed favorable with conventional funding organizations (NFWF, etc.)  Lower Little Swatara identified as a priority watershed in the Lebanon CAP.			NFWF Small Watershed Grant (SWG), Most Effective Basins Funding (MEBF), Ches. Bay Trust (CBT), Growing Greener (GG)						
1.5	Promote and monitor BMP implementation	<i>Per BMP targets outlined in P.I. 3 Coordination for individual catchments</i>	County, BCCD, TSPs, municipal., farmers, local watershed groups, non-profits	Upper Little Swatara catchments	On-going with inherent tie to Actions 1.2 and 1.3	Outreach materials may be needed for individual engagements <b>(Expanded BMP Quick Reference Guide with all BMPs included would assist this effort)*</b>	CWP, BCCD, County, TSPs, local engineers/consultants		All noted under other actions				BMP implement. funding (as noted under Action 3.1 for implement. challenges and recom.)	All noted under other actions	

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**Each county-based local area will use this template to identify:**

1. Inputs – These are both existing and needed resources, public and private, to implement the identified priority initiative. These include both technical and financial resources, such as personnel, supplies, equipment and funding.
2. Process – what is each partner able to do where and by when. These are the action items listed under each priority initiative.
3. Outputs and outcomes – both short and long-term. These are the priority initiatives identified by each county. The performance targets are the intermediate indicators that will measure progress.
4. Implementation challenges – any potential issues or roadblocks to implementation that could impede outputs and outcomes.

**Asterisk:** Place an asterisk next to the action number(s) for action items that appear in both the County Planning and Progress Template and the Programmatic Recommendations Template.

**For each Priority Initiative or Program Element:** Use the fields, as defined below, to identify the inputs and the process that will be followed to achieve each priority initiative. This is the “who, what, where, when and how” of the plan:



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							Technical	Source	Financial	Source	Technical	Suggested Source	Financial	Suggested Source	

**Description** = What. This may include programs that address prevention, education, or as specific as planned BMP installations that will address the Priority Initiative. A programmatic or policy effort will require some ability to quantify the anticipated benefits which will allow calculation of the associated nutrient reductions.

**Performance Target** = How. This is an extension of the Description above. The Performance Target details the unique BMPs that will result from implementation of the Priority Initiative and serves as a benchmark to track progress in addressing the Priority Initiative. Performance Targets may be spread across multiple Responsible Parties, Geographies, and Timelines based on the specifics of the Initiative.

**Responsible Party(ies)** = Who. This is/are the key partner(s) who will implement the action items through outreach, assistance or funding, and who will be responsible for delivering the identified programs or practices.

**Geographic Location** = Where. This field identifies the geographic range of the planned implementation. This could extend to the entire county or down to a small watershed, based on the scale of the Priority Initiative, range of the Responsible Party, or planned funding/resources. *NOTE: Resource limitations alone should not limit potential implementation as additional funding may become available in the future.*

**Expected Timeline** = When. Provide the expected completion date for the planned activity. This should be a reasonable expectation, based on knowledge and experience, that will aid in tracking progress toward addressing the Priority Initiative.

**Resources Available: Technical & Funding** = This field will note technical and financial resources secured/available to implement the program (Description). This is the total of the resources identified in the County Resources Inventory Template below allocated to the priority initiative as a whole; or, if available, to each action.

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							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
<b>Priority Initiative 2: Conestoga-Cocalico</b>														
2.1	Upper Conestoga (UC) 319 Plan development and implementation	<i>Summer 2023 for 319 plan (dependent on securing funding)</i>	UC 319 Plan Steering Committee, Chesapeake Bay Found. (CBF), Berks County Conservation District (BCCD), NRCS, Ag Technical Service Providers (TSPs)	Upper Conestoga catchments	2022-2023 for plan development followed by implement.	Carry over identified 319 plan opportunities and initiatives into the Berks Bay Action Plan (BBAP) and Catchment Targeting inventories  BBAP participation with 319 plan steering committee  “Leaning” on 319 plan development for BBAP implementation in the UC catchments	CBF, BCCD, BerksNature, County, local engineers/consultants, TSPs, Lancaster Farmland Trust (LFT)		Growing Greener (GG) (CBF applying for 319 plan develop. Funds)				BMP implement. Funding (as noted under Action 3.1 for implement. Challenges and recom.)	
2.2	One-on-one farmer engagements via Catchment Management Database (CMD) prioritization	<i>Engagements list for each catchment per Action 3.1</i>	CBF, BCCD, NRCS, TSPs	All catchments	On-going with inherent tie to Actions 2.1 and 3.1	Augmented messaging and outreach combining 319 plan goals and objectives with BBAP action items and goals  Conduct Cocalico-based efforts in conjunction with Upper Conestoga efforts	CBF, BCCD, TSPs						Funding for expanded engagements as noted under Action 3.1	
2.3	One-on-one municipal engagements	<i>Engagements list for each catchment per Action 3.1</i>	CBF, County	Municipalities in all catchments	On-going with inherent tie to Actions 2.1 and 3.1	Augmented messaging and outreach combining 319 plan goals and objectives with BBAP action items and goals  Conduct Cocalico-based efforts in conjunction with Upper Conestoga efforts	BCCD, County, local engineers/consultants							

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							Technical	Source	Financial	Source	Technical	Suggested Source	Financial	Suggested Source	
2.4	Explore partnerships with Lancaster and Chester County for regional efforts		County, BCCD	Catchments within shared watersheds	On-going	Watershed-based, multi-entity, collaborative grant applications are viewed favorable with conventional funding organizations (NFWF, etc.)			NFWF Small Watershed Grant (SWG), NFWF Most Effective Basins Funding (MEBF), Growing Greener (GG), Ches. Bay Trust (CBT)						
2.5	Promote and monitor BMP implementation	<i>Per BMP targets outlined in P.I. 3 Coordination for individual catchments</i>	County, BCCD, TSPs, municipal., farmers, local watershed groups, non-profits	Upper Conestoga (and Cocalico) catchments	On-going with inherent tie to actions 2.2 and 2.3	Outreach materials may be needed for individual engagements <b>(Expanded BMP Quick Reference Guide with all BMPs included would assist this effort)*</b>  Coordinating Action Team (AT) to bring along Cocalico catchments simultaneously with 319 plan development	CBF, BCCD, County, TSPs, local engineers/consultants		All noted under other actions				BMP implement. funding (as noted under Action 3.1 for implement. challenges and recom.)	All noted under other actions	

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							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
<b>Priority Initiative 3: Coordination</b>														
<b>3.1</b>	Catchments Assessments and Prioritization	<p>TBD for each individual catchment</p> <p>See timeline for annual targets of assessments; each catchment will have an identified BMP acreage from the BMP targets identified in Actions 3.2 – 3.5</p> <p><i>Game plan by late 2021</i></p>	<p>Berks County Conservation District (BCCD), Berks County Planning Commission (BCPC)/GIS, 319 plan comm., local municipalities, County GIS, Ag Preserve. Board, NRCS</p>	<p>All areas (all catchments to be analyzed and prioritized)</p> <p>Analyses order will follow “worst-to-first” hierarchy based on Catchment Management Database (CMD) mass and incremental loading scores.</p>	<p>Funding assisted timeline: 27 total catchment groups 2021: 4, 2022: 18 2023: 4</p> <p>Existing funding timeline: 27 total catchment groups, 6/year (2022-2026)</p>	<p>Upper Little Swatara and Upper Conestoga efforts will result in prioritization info, opportunities identification, etc. for catchments in these areas</p> <p>Action Teams (Ats) will provide additional focus on areas outside of 319 Plan(s) efforts</p> <p>GIS overlay analyses of individual catchments to outline engagements, opportunities, etc. (“game plan” for each catchment)</p> <p><b>Results of these analyses are intended to outline specific BMP implementation actions. Implementation actions will only be realized with additional funding and permitting flexibility across all considerations.*</b></p>	<p>Catchment Management Database (CMD), County GIS, USGS SPARROW, Practice Keeper (PK)</p>		<p>NFWF SWG/INSRG programs</p>		<p>Game plan outlining assess. processes</p>		<p>Funding for “boots on the ground” verifications and/or engagements (\$2,500/catchment = \$67,500; long-term verification processes funding and personnel outlined with PK needs under Action 3.2</p> <p>Berks Bay Action Plan (BBAP) implement. activities associated with assessments, engage., data entry, etc. that drive long-term BMP imp. would occur 2021-2030 without added funding</p>	<p>DEP, NFWF</p>

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							Technical	Source	Financial	Source	Technical	Suggested Source	
3.2	Promote and monitor ag BMP implementation	<p><i>Soil Conservation and WQ Plans – 12,000 acres</i></p> <p><i>Nutrient Management Core Nitrogen – 10,500 acres</i></p> <p><i>Nutrient Management Core Phosphorus – 4,700 acres</i></p> <p><i>Nutrient Management Placement Nitrogen – 3,400 acres</i></p> <p><i>Nutrient Management Timing Nitrogen – 3,800 acres</i></p> <p><i>Nutrient Management Rate Nitrogen – 2,700 acres</i></p> <p><i>Nutrient Management Placement Phosphorus – 2,700 acres</i></p> <p><i>Nutrient Management Timing Phosphorus – 2,700 acres</i></p> <p><i>Nutrient Management</i></p>	<p>BCCD, NRCS, Ag Technical Service Providers (TSPs), farmers, Center for Watershed Protection (CWP), Chesapeake Bay Foundation (CBF)</p>	<p>All areas with emphasis provided towards prioritized catchments through Action 3.1 and 319 plan(s) development</p>	<p>On-going with inherent tie to Action 3.1 and 319 plan(s) development and implement. timelines</p>	<p>Broad slate of BMP types across ag industry and based on individual farm conservation needs as identified through CMD prioritization and 319 plan objectives</p> <p>Several rates based on a combination of underreported BMPs where capture of unreported acres will be achieved through catchment prioritization efforts and Practice Keeper (PK) data entry and management</p> <p>Farmer resistance and buy-in</p> <p>Education to be achieved via one-on-one engagements by balancing farmer’s needs and wants with fitting into a recognized BMP for nutrient and sediment reductions.</p> <p><b>Limited definition of cover crops and what counts as a reduction*</b></p> <p><b>Transfer of plans in NRCS platform to PK would reduce long-term additional</b></p>	<p>Farm survey, NRCS, TSPs, BCCD, Ag Preserve Board, CWP, CBF, Penn State Ext.</p>	<p>REAP, CEG, EQIP, RCPP, MEBF, State reimb. Program, PennVEST, PL566</p>	<p>Various</p>	<p>2 persons: PK manage. and BMP verifications and/or reconcile. processes (these individuals would perform these activities indefinitely)</p>	<p>\$120,000/yr for additional personnel (2 persons noted under technical needs; this includes funding for added personnel and equipment costs)</p> <p>Capital Cost: ~\$8.9 million (includes ~\$300,000 for SC plans, ~\$700,000 for cover crops, ~\$7.0 million for AWS, and ~\$40,000 for prescribed grazing practices)</p>		





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							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
		<p><i>Dairy Precision Feeding – 2,300 animal units</i></p> <p><i>Animal Waste Management Systems – 7,800 animal units</i></p> <p><i>Manure Transport out of Berks County – 2,000 dry tons/year</i></p> <p><i>Mortality Composting – 3 systems</i></p> <p><i>Manure Incorporation – 700 acres</i></p>				350 inspections occurring annually (with NRCS visiting ~500 farms/year), these efforts and knowledge will streamline Action 3.1 activities for farms in targeted catchments; added persons would augment these visits for verifications								
3.3	Promote and monitor urban/developed BMP implementation	<p><i>Runoff Reduction Performance Standards – 400 acres</i></p> <p><i>Stormwater Treatment Performance Standards – 200 acres</i></p> <p><i>Extended Dry Ponds – 50 acres</i></p> <p><i>Infiltration Practices – 40 acres</i></p>	Local municipalities, local watershed groups, BerksNature, Alliance for the Chesapeake Bay (ACB), County GIS, developers	Developed and semi-rural areas (all catchments)	On-going with inherent tie to Action 3.1	<p>Significant reconciliation of numbers is necessary (to be completed via catchment analyses)</p> <p>Individual municipal engagements via one-on-one engagements and as part of the catchment prioritization processes will be key for “buy-in” and establishing individual municipal needs.</p>	Local engineers, DEP, County MS4 group, County GIS		GG, NFWF, CBT, DCNR, Keystone, developers, municipal, PennVEST			Capital Cost: ~\$19.9 million (includes ~\$8,000 for conservation landscaping, ~\$6.3 million for SWM facilities, and ~\$5.7 million for septic systems)		Costs are based on if full slate of

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							Technical	Source	Financial	Source	Technical	Suggested Source		Financial	Suggested Source
		<p><i>Bioretention – 25 acres</i></p> <p><i>Vegetated Open Channels – 25 acres</i></p> <p><i>Impervious Disconnection – 0.24 acres</i></p> <p><i>Advanced IDD&amp;E Control – 140 acres treated</i></p> <p><i>Conservation Landscaping – 40 acres</i></p> <p><i>Urban Tree Canopy – 1 acre</i></p> <p><i>Urban Forest Planting – 10 acres</i></p> <p><i>Urban Nutrient Management – 650 acres</i></p> <p><i>Conv. Septic Denitrification – 150 systems</i></p>				<p>Identify needs and assistance channels for compliant MS4 programs (specifically MCM #3 and education/outreach channels) by individual muni.</p> <p>Modify implementation rates in 2023 after catchment targeting inventories generated.</p> <p>319 plan efforts will focus on ag, Coord. AT will focus on complementing efforts for developed areas in applicable catchments.</p> <p><b>Separate database may need to be considered for capturing all Ch. 102/ land development BMPs already in place*</b></p> <p>Track developments by catchments (to track impervious)</p>								<p>BMPs are required), current high-level assumption is 60%-75% of the proposed BMPs are already implemented but not captured through an appropriate reporting mechanism</p>	
3.4	Promote and monitor riparian buffers and stream BMP implementation	<p><i>Forest buffers – 300 acres</i></p> <p><i>Forest buffers with exclusion fencing – 50 acres</i></p>	BCCD, ACB, CBF, Stroud, TSPs, local municipalities, local watershed groups, local municipalities,	All areas with emphasis provided towards prioritized catchments	Ongoing with inherent tie to Action 3.1 and 319 plan(s) development timelines	<p>Landowner/farmer resistance or buy-in</p> <p>Buffers with exclusion fencing are exclusive to riparian corridors (and applied to pasture land uses);</p>	ACB, CBF, BerksNature, BCCD, Stroud, DCNR, NRCS		CREP, DCNR, GG, MEBF, Keystone, NFWF		Added persons noted under Action 3.2 can provide long-term verification processes		Capital Cost: ~\$4.4 million (includes ~\$1.2 million for forest buffers and ~\$2.5 million		

## Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

**Green** - action has been completed or is moving forward as planned    **Yellow** - action has encountered minor obstacles    **Red** - action has not been taken or has encountered a serious barrier

Action #	Description	Performance Target(s)	Responsible Party(ies) and Partnerships	Geographic Location	Expected Timeline	Potential Implementation Challenges or Recommendations	Resources Available			Resources Needed			Review Checklist Comments
							Technical	Source	Financial	Source	Technical	Suggested Source	

		<p><i>Narrow forest buffers with exclusion fencing – 50 acres</i></p> <p><i>Grass Buffers – 300 acres</i></p> <p><i>Grass Buffers with exclusion fencing – 10 acres</i></p> <p><i>Narrow grass buffers with exclusion fencing – 10 acres</i></p> <p><i>Urban forest buffers – 20 acres</i></p> <p><i>Urban stream restoration – 1,500 linear feet</i></p> <p><i>Non-urban stream restoration – 3,500 linear feet</i></p> <p><i>Wetland restoration – 8 acres</i></p> <p><i>Wetland creation – 12 acres</i></p> <p><i>Dirt &amp; Gravel Road Program (Driving Surface + Raising the Roadbed) – 750 linear feet</i></p>	Ag Preserve. Board			<p>Buffers (no exclusion fencing) are not exclusive to riparian corridors and applied to crop, hay, turfgrass, and similar land uses (can be applied to field borders and similar upland scenarios)</p> <p>Newly acquired buffer maintenance equipment should assist with long-term considerations</p>									<p>for stream restoration)</p> <p>Long-term maintenance costs will need TBD</p>
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## Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

Green - action has been completed or is moving forward as planned    Yellow - action has encountered minor obstacles    Red - action has not been taken or has encountered a serious barrier

Action #	Description	Performance Target(s)	Responsible Party(ies) and Partnerships	Geographic Location	Expected Timeline	Potential Implementation Challenges or Recommendations	Resources Available			Resources Needed			Review Checklist Comments	
							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
3.5	Promote and monitor conservation/preservation BMP implementation	<i>Forest Conservation – 293 acres</i> <i>Agricultural Conservation – 492 acres</i> <i>Wetland Conservation – 15 acres</i>	BCCD, Ag. preserve. Board, BerksNature, local municipalities, Kittatinny Coalition	All areas	On-going	Carbon credits program for private forests (provides incentives for forest conservation that also provides nutrient and sediment reductions)  BerksNature, Ag Preserve. Board, and Kittatinny Coalition are drivers for preserved farms	Ag Preserve. Board, BCCD, County, BerksNature, CBF							
3.6	Data management	<i>Action 3.1 established processes by fall of 2021 to dictate data management tasks and activities</i>	County, BCCD	All areas/catchments	Ongoing; game plan by late summer/early fall 2021 (tied to Catchment Targeting Action 3.1)	House the master CMD and related attributes and inventory at County GIS  Final game plan for Catchment Targeting Initiative will dictate layers and attributes table  Ag information stored in PK at BCCD	PK, FieldDoc, County GIS						Dependent on PK manager funding noted under Action 3.2	

## Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

Green - action has been completed or is moving forward as planned    Yellow - action has encountered minor obstacles    Red - action has not been taken or has encountered a serious barrier

Action #	Description	Performance Target(s)	Responsible Party(ies) and Partnerships	Geographic Location	Expected Timeline	Potential Implementation Challenges or Recommendations	Resources Available			Resources Needed			Review Checklist Comments	
							Technical	Source	Financial	Source	Technical	Suggested Source		Financial
3.7	Programs/plans alignment as part of assessment processes	<i>Master list of plan(s) overlays as part of Action 3.1 established assessment processes game plan</i>	County, BCCD, CWP, CBF	All areas/catchments	On-going with master list established as part of Action 3.1	<p>Ensure efforts do not conflict and/or align with other efforts; alignment protocols built into Catchment Targeting processes.</p> <p>Push/pull applicable information/data from 319 plan(s) development processes</p> <p>Action 3.1 assessments include plan/data overlays during desktop analysis portion of activities (intent is to potentially match BMP opps. With previous plan(s) objectives)</p>	MS4 PRPs, Comp Plan, Source Water Protection (SWP) program, and related local plans							
3.8	BMP Reporting Reconciliation		BCCD, local municipalities, local watershed groups, County, CWP, CBF, TSPs	All areas	On-going; tied to Catchment Targeting and 319 plan(s) development findings, and Action 3.6 for data manage.	<p>Ensure centralized platform (County GIS) appropriately captures and displays individual catchment needs, captured unreported BMPs, etc. and aligns with reporting processes</p> <p>Will require “boots-on-the-ground” verifications</p>	Local engineers/consultants, TSPs, BCCD					<p>Dependent on PK funding noted under Action 3.2 for ag-related BMPs reconcile. and data entry</p> <p>Dependent on funding outlined under Action 3.1 for catchment targeting</p>		

## Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

Green - action has been completed or is moving forward as planned    Yellow - action has encountered minor obstacles    Red - action has not been taken or has encountered a serious barrier

Action #	Description	Performance Target(s)	Responsible Party(ies) and Partnerships	Geographic Location	Expected Timeline	Potential Implementation Challenges or Recommendations	Resources Available			Resources Needed			Review Checklist Comments	
							Technical	Source	Financial	Source	Technical	Suggested Source		Financial

### Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

**Each county-based local area will use this template to identify:**

1. Inputs – These are both existing and needed resources, public and private, to implement the identified priority initiative. These include both technical and financial resources, such as personnel, supplies, equipment and funding.
2. Process – what is each partner able to do where and by when. These are the action items listed under each priority initiative.
3. Outputs and outcomes – both short and long-term. These are the priority initiatives identified by each county. The performance targets are the intermediate indicators that will measure progress.
4. Implementation challenges – any potential issues or roadblocks to implementation that could impede outputs and outcomes.

**Asterisk:** Place an asterisk next to the action number(s) for action items that appear in both the County Planning and Progress Template and the Programmatic Recommendations Template.

**For each Priority Initiative or Program Element:** Use the fields, as defined below, to identify the inputs and the process that will be followed to achieve each priority initiative. This is the “who, what, where, when and how” of the plan:

**Description** = What. This may include programs that address prevention, education, or as specific as planned BMP installations that will address the Priority Initiative. A programmatic or policy effort will require some ability to quantify the anticipated benefits which will allow calculation of the associated nutrient reductions.

**Performance Target** = How. This is an extension of the Description above. The Performance Target details the unique BMPs that will result from implementation of the Priority Initiative and serves as a benchmark to track progress in addressing the Priority Initiative. Performance Targets may be spread across multiple Responsible Parties, Geographies, and Timelines based on the specifics of the Initiative.

**Responsible Party(ies)** = Who. This is/are the key partner(s) who will implement the action items through outreach, assistance or funding, and who will be responsible for delivering the identified programs or practices.

**Geographic Location** = Where. This field identifies the geographic range of the planned implementation. This could extend to the entire county or down to a small watershed, based on the scale of the Priority Initiative, range of the Responsible Party, or planned funding/resources. *NOTE: Resource limitations alone should not limit potential implementation as additional funding may become available in the future.*

**Expected Timeline** = When. Provide the expected completion date for the planned activity. This should be a reasonable expectation, based on knowledge and experience, that will aid in tracking progress toward addressing the Priority Initiative.

**Resources Available: Technical & Funding** = This field will note technical and financial resources secured/available to implement the program (Description). This is the total of the resources identified in the County Resources Inventory Template below allocated to the priority initiative as a whole; or, if available, to each action.

**Resources Needed: Technical & Funding** = This field will note technical and financial resources needed/outstanding to implement the program (Description). This is the total of the additional resources projected and identified as needed in the County Resources Inventory Template below allocated to the priority initiative as a whole; or, if possible, to each action.

**Potential Implementation Challenges/Issues** = This field will note challenges and issues that may delay program implementation (Description).

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## Phase 3 Watershed Implementation Plan (WIP) Programmatic Recommendations Template

Action #	Description	Performance Target(s)	Expected Timeline	Potential Implementation Challenges	Potential Recommendations on Improvement	Resources Needed			
						Technical	Suggested Source	Financial	Suggested Source
<b>Programmatic Recommendations: Berks County</b>									
1.1	Increase funding for personnel, projects, etc. for BBAP implementation (Action 3.1 (and Berks Bay Action Plan (BBAP) in general))		For 2022 implementation activities	The BBAP outlines a set of actions, initiatives, etc. the county believes will lead to successful and significant nutrient and sediment reductions. Numerous financial and human resource gaps exist for full implementation that requires additional and consistent funding streams.	Establish BBAP implementation support funding for workforce expansion, equipment, and BMP implementation.			\$67,000 for catchment targeting; \$120,000/yr added personnel; ~\$21.9-\$33.2 million for BMP implement.	
1.2	Expand cover crops (CC) definition (Action 3.2)	Added scenario for cover crops	Prior to fall 2022	Traditional CC: No fall nutrients and not harvested in the spring; Traditional CC w/fall nutrients: Yes fall nutrients but not harvested in spring; Commodity CC: No fall nutrients and is harvested in the spring; Missing classification: Yes fall nutrients and harvested in the spring.	Create a cover crops classification that allows the application of fall nutrients and is harvested in the spring.	Added definition in BMP Quick Reference Guide			
1.3	BMP reconciliation parameters (Action 3.3)		Spring 2022	Through catchment-to-catchment analyses, it is anticipated that uncaptured or underreported BMPs will be captured. This is primarily associated with Ch. 102/land development BMPs. Intent is to capture these BMPs in an inventory. Understanding the parameters, attributes, etc. that need to be part of the data and information captured up-front will provide consistent processes.	1) Establish a list of the minimum parameters and attributes that should be noted when underreported Ch. 102/land development BMPs are captured.  2) Establish a reporting mechanism(s) for captured Ch. 102/land development BMPs.	DEP			
1.4	Establish a clear set of directions and parameters for PK data entry			Clear set of guidelines established by NRCS and PADEP for what, where, how, etc. that can be/should be entered into Practice Keeper from NRCS generated Soil Conservation Plans that still ensures adherence to NRCS's privacy policies.	Establish a clear Standard Operating Procedure (SOP) or similar document for PK data entry that can be used as a guide for entries and local communications amongst various agencies.	NRCS-DEP			
1.5	BMP Quick Reference Guide (Actions 1.5 and 2.5)	Guide with all BMPs providing reductions included	2022	Not all BMPs that provide or count towards reductions are included in the guide.	Expand the BMP Quick Reference Guide to include descriptions, requirements, etc. of all BMPs credited in CAST/Bay model.	DEP, EPA			

1.6	Transfer of NRCS generated Soil Conservation Plans into local PracticeKeeper (PK) platform (Action 3.2)	Ag BMPs transferred into local PK platform	Prior to Sept 2023	Significant resources will be required for capture and entry of Soil Conserv. Plans (and corresponding BMPs) into PK that were generated by entities other than SCCD (e.g. NRCS)		NRCS-DEP			
1.7	Mushroom composting definition (Action 3.2)	Added definition for mushroom composting				Create a separate definition (or a sub-category of existing manure composting definitions) specific to mushroom composting			
1.8	Livestock in stream (Action 3.2)			Policies as it relates to livestock in streams is incoherent.		Establish a consistent policy as it relates to livestock in streams.			
1.9	Accelerated permitting for BBAP identified projects of regional importance (Action 3.1)	Dedicated arena (time, place, etc.) on a regular basis and protocols/ processes for stream-lined permitting	ASAP would be ideal	Several “large-scale” projects and opportunities exist that provide benefits above and beyond significant nutrient and sediment reductions (e.g. localized flood reduction). Permit approval timeframes can be inhibiting factors between design and implementation.		Provide arena and processes for accelerating permitting requirements for priority projects.	DEP		

### Phase 3 Watershed Implementation Plan (WIP) Planning and Progress Template

Each county-based local area will use this template to identify:

- Inputs** – The statewide and/or federal policies, regulations, initiatives, programs, funding and resources that will help your county meet its goal.
- Process** – What are the changes that need to occur for the county to be successful in the process? These are the action items listed under each priority recommendation.
- Outputs and outcomes** – Both short and long-term. These are the programmatic recommendations identified by each county. Performance targets identify your county’s needed change in order to meet your county goal.
- Implementation challenges** – Any potential issues or roadblocks to implementation that could impede outputs and outcomes.

**Asterisk:** Place an asterisk next to the action number(s) for action items that appear in both the County Planning and Progress Template and the Programmatic Recommendations Template.

**For each Programmatic Recommendation:** Use the fields, as defined below, to identify the inputs and the process that will be followed to achieve each priority initiative. This is the “what, when and how” of the plan:

**Description** = What. This may include programs that address prevention, education, or changes to the current policy and regulation. A programmatic or policy effort will allow for the completion of cation items listed in the Planning and Progress Template.

**Performance Target** = How. This is an extension of the Description above. The performance target details the programmatic change that will enable you to complete the action items identified in the Planning and Progress Template. This can be a further description of the challenge to implementation from the Planning and Progress Template.

**Expected Timeline** = When. Provide the needed completion date for the programmatic recommendation that will assist your county in meeting its goal. This should be a reasonable expectation, based on knowledge and experience, that will aid in tracking progress toward addressing the Priority Initiative.

**Potential Implementation Challenges** = This field will note challenges and issues that may delay program implementation (Description). Potential challenges may relate to your county Planning and Progress Template.

**Potential Recommendations on Improvement** = This field will note recommendations on how to change or improve the program (Description).

**Resources Needed: Technical & Funding** = This field will note technical and financial resources needed/outstanding to implement the program (Description).

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## **APPENDIX**

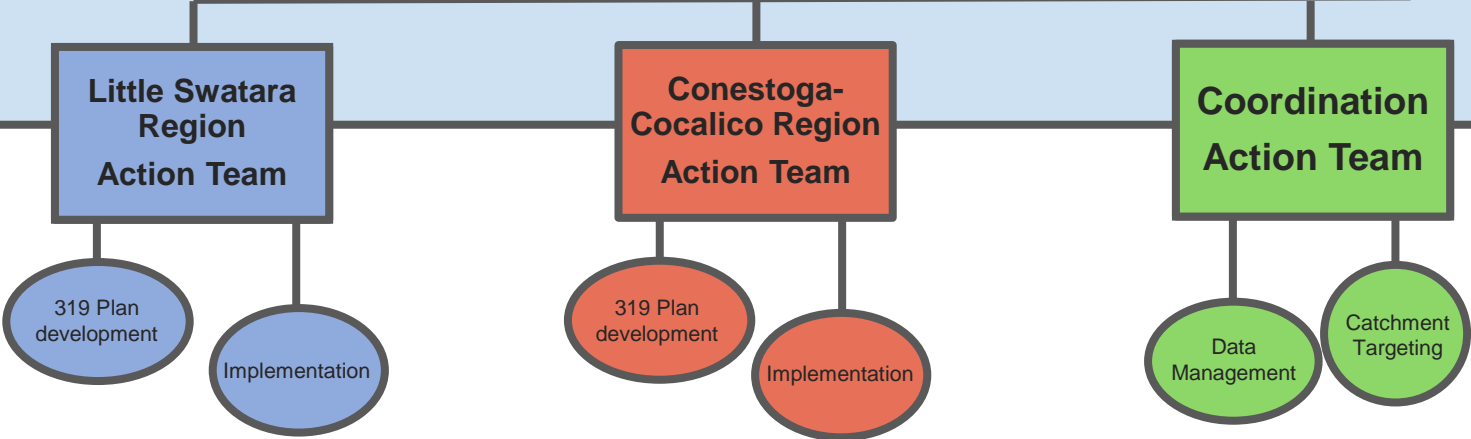
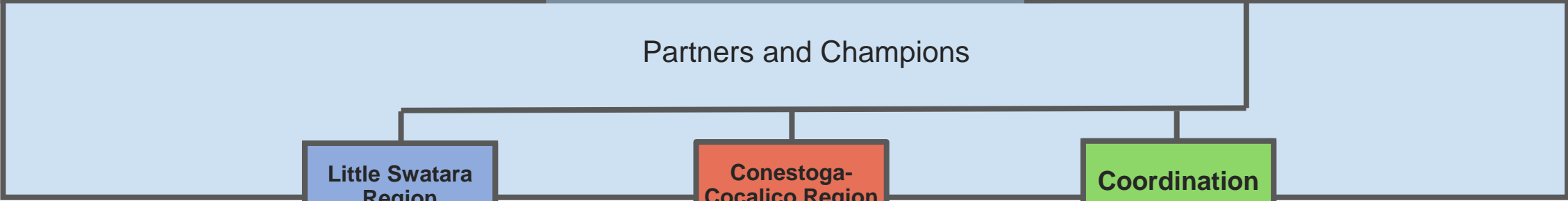
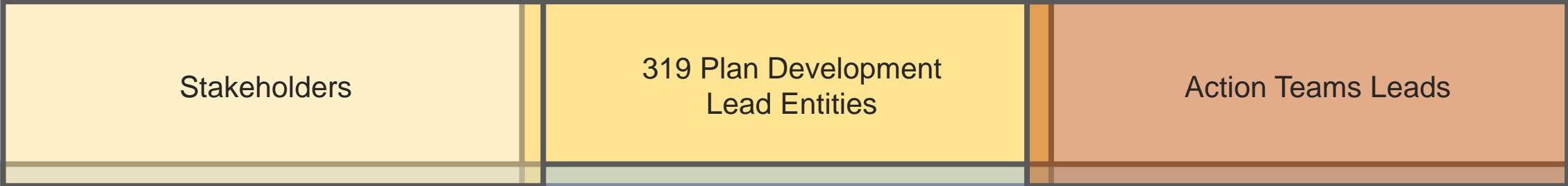
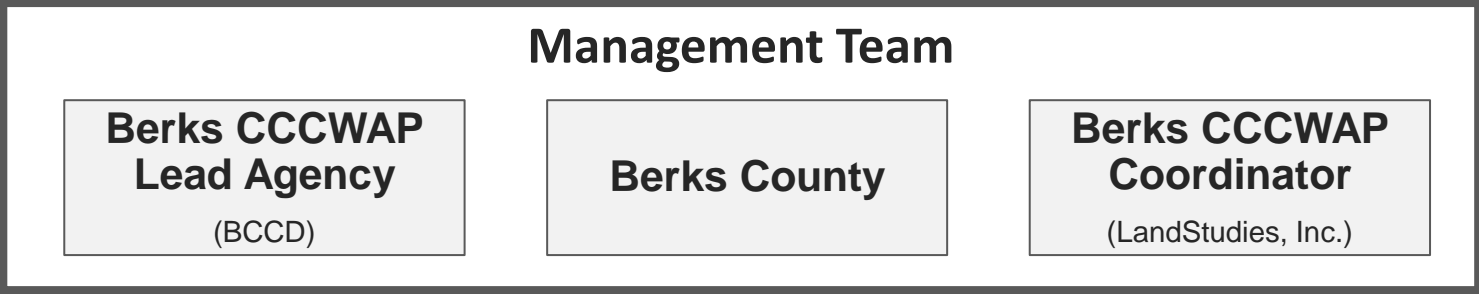
Organizational Chart

Watersheds Map

Catchment Management Database

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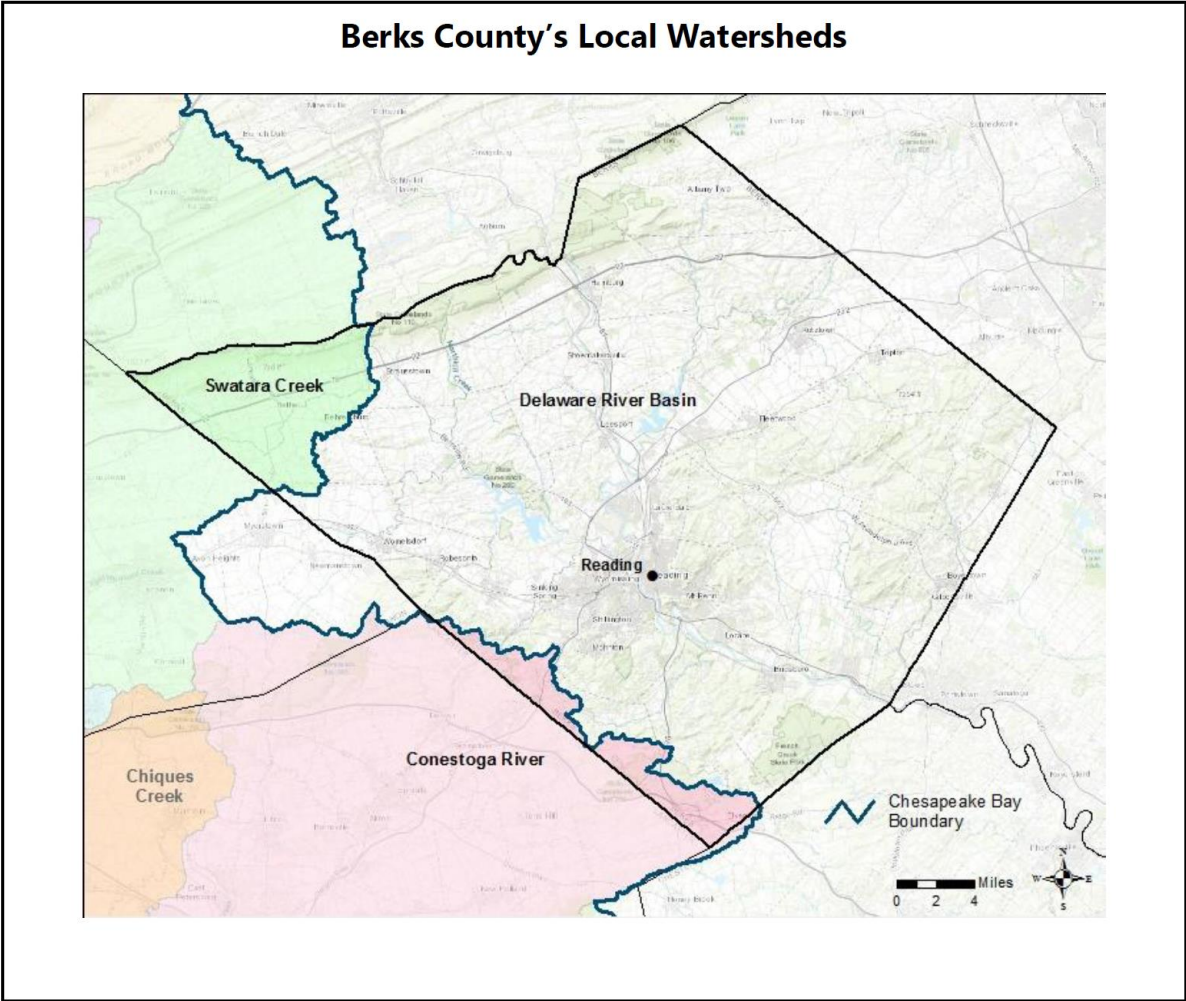
# Berks Bay Action Plan (BBAP) Organizational Chart



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# Berks County Local Chesapeake Bay Watersheds Map



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**BERKS COUNTY CATCHMENT MANAGEMENT DATABASE**

HUC-10	HUC-12	CATCHMENT GROUPING ID	CATCHMENT GROUP NAME	STREAMS	PRIMARY LAND USE	IMPAIRED STREAMS	GEO. CLASS.	HGMR CLASS.	URBANIZED AREA	INCREMENTAL LOADING SCORING				MASS LOADING SCORING			WQ DATA	WQ DATA ADJ FACTOR	QUALITATIVE NOTES	QUAL ADJ FACTOR	TOTAL CATCHMENT SCORE	
										SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS	INC LDG SUB-SCORE	SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS						MASS LDG SUB-SCORE
Little Swatara Creek	Lower Swatara Creek (020503050606)	050606-1	Headwaters Monroe Creek	Monroe Creek	Forest	Yes	Sandstone, Shale	VRS	No	5.00	5.00	5.00	5.00	5.00	5.00	5.00						
		All other catchments in Lower Swatara Creek HUC12 are outside of Berks County																				
Little Swatara Creek	Lower Little Swatara Creek (020503050703)	050703-1	Headwaters Elizabeth Run	None in Berks	Forest	No	Shale	VRS	No	4.00	4.00	4.00	4.00	5.00	5.00	5.00	5.00					
		050703-2	Headwaters Earlackill Run	None in Berks	Forest, Agriculture	No	Shale	VRS	No	2.50	2.50	3.00	2.67	5.00	4.50	5.00	4.83					
		050703-3	Headwaters Lower Little Swatara Creek	Little Swatara Creek, UNTs	Forest, Agriculture	Yes	Shale, Graywacke	VRS	Yes	4.00	3.75	4.25	4.00	4.50	2.75	4.50	3.92					
		All other catchments in Lower Little Swatara Creek HUC12 are outside of Berks County																				
Cocalico Creek	Little Cocalico Creek-Cocalico Creek (020503060901)	060901-1	UNTs to Little Cocalico Creek	None in Berks	Forest, Residential	No	Mafic gneiss, graphitic gneiss, felsic gneiss, Quartzite, Sandstone, Quartz conglomerate	BR, ML	No	4.00	4.67	3.33	4.00	5.00	5.00	5.00	5.00					
		060901-2	UNTs to Little Cocalico Creek	Little Cocalico Creek, UNTs	Forest, Residential	Yes	Sandstone, Quartz conglomerate	ML	Yes	3.33	4.00	3.33	3.56	5.00	4.67	5.00	4.89					
Conestoga River	Little Muddy Creek (020503061101)	061101-1	Headwaters Little Muddy Creek	Little Muddy Creek	Forest, Agriculture, Residential	Yes	Sandstone, Quartz conglomerate, Diabase	ML	Yes	3.75	4.25	3.50	3.83	5.00	4.67	5.00	4.89					
		061101-2	Headwaters Little Muddy Creek	Little Muddy Creek	Forest, Agriculture, Residential	Yes	Sandstone, Quartz conglomerate, Diabase	ML	Yes	3.50	4.50	3.50	3.83	5.00	5.00	5.00	5.00					
Conestoga River	Muddy Creek (020503061102)	061102-1	Western Headwaters UNTs to Muddy Creek	UNT to Muddy Creek	Forest	Yes	Sandstone, Quartz conglomerate, Diabase	ML	No	3.67	4.33	3.33	3.78	5.00	4.67	5.00	4.89					
		061102-2	Western Headwaters UNTs to Muddy Creek	UNTs to Muddy Creek	Forest, Agriculture, Residential	Yes	Sandstone, Quartz conglomerate	ML	No	3.83	4.17	3.38	3.79	5.00	4.75	5.00	4.92					
River		061103-1	West Branch Conestoga River	West Branch Conestoga, UNTs	Forest, Agriculture	Yes	Limestone, Diabase, Arkosic sandstone	ML	Yes	3.75	4.50	3.63	3.96	5.00	5.00	5.00	5.00					
		061103-2	Western Headwaters UNTs to Conestoga River	UNTs to Conestoga River	Forest, Industry	Yes	Sandstone, Diabase, Arkosic sandstone, Quartz conglomerate	ML, PCA	No	4.00	5.00	4.00	4.33	5.00	5.00	5.00	5.00					
		061103-3	East Branch Conestoga River	East Branch Conestoga River	Commercial, Residential, Industry	Yes	Limestone, Diabase, Arkosic sandstone	ML, PCA	Yes	4.50	4.50	5.00	4.67	5.00	4.50	5.00	4.83					

Conestoga	Upper Conestoga River (020503061103)	061103-4	Headwaters East Branch Conestoga River	East Branch Conestoga River	Forest, Commercial	Yes	Limestone, Diabase, Arkosic sandstone	ML	No	5.00	5.00	4.50	4.83	5.00	4.50	5.00	4.83					
		061103-5	Upper Headwaters East Branch Conestoga River	East Branch Conestoga River, UNTs	Forest, Agriculture	Yes	Sandstone, Diabase, Arkosic sandstone, Quartzite	ML, PCA, PCR	No	4.00	3.50	3.00	3.50	5.00	4.50	5.00	4.83					
		061103-6	Headwaters Conestoga River	Conestoga River, UNTs	Agriculture, Commercial, Residential	Yes	Limestone, Dolomite, Argillaceous dolomite, Quartzite, Arkosic sandstone	PCA, PCR	Yes	2.50	2.50	2.50	2.50	5.00	3.33	4.67	4.33					

HUC-10	HUC-12	CATCHMENT GROUPING ID	CATCHMENT GROUP NAME	STREAMS	PRIMARY LAND USE	IMPAIRED STREAMS	GEO. CLASS.	HGMR CLASS.	URBANIZED AREA	INCREMENTAL LOADING SCORING				MASS LOADING SCORING			WQ DATA	WQ DATA ADJ FACTOR	QUALITATIVE NOTES	QUAL ADJ FACTOR	TOTAL CATCHMENT SCORE	
										SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS	INC LDG SUB-SCORE	SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS						MASS LDG SUB-SCORE
Little Swatara Creek	Crosskill Creek (020503050701)	050701-1	Headwaters Meck Creek	Meck Creek, UNTs	Forest, Agriculture	Yes	Sandstone, Shale	VRS	No	4.00	4.50	4.50	4.33	5.00	5.00	5.00	5.00					
		050701-2	Crosskill Creek	Crosskill Creek, UNTs	Forest, Agriculture	Yes	Shale	VRS	No	1.00	2.00	2.00	1.67	5.00	3.00	5.00	4.33					
		050701-3	Headwaters UNT to Crosskill Creek	UNT to Crosskill Creek	Forest, Agriculture	Yes	Sandstone, Shale, Limestone	VRS, VRC	No	3.33	4.00	4.00	3.78	5.00	4.00	5.00	4.67					
		050701-4	Eastern Headwaters UNT to Crosskill Creek	UNT to Crosskill Creek	Forest, Agriculture	Yes	Sandstone, Shale	VRS	No	3.83	4.00	3.83	3.89	5.00	4.75	5.00	4.92					

HUC-10	HUC-12	CATCHMENT GROUPING ID	CATCHMENT GROUP NAME	STREAMS	PRIMARY LAND USE	IMPAIRED STREAMS	GEO. CLASS.	HGMR CLASS.	URBANIZED AREA	INCREMENTAL LOADING SCORING				MASS LOADING SCORING			WQ DATA	WQ DATA ADJ FACTOR	QUALITATIVE NOTES	QUAL ADJ FACTOR	TOTAL CATCHMENT SCORE	
										SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS	INC LDG SUB-SCORE	SEDIMENT	TOTAL NITROGEN	TOTAL PHOSPHORUS						MASS LDG SUB-SCORE
Little Swatara Creek	Upper Little Swatara Creek (020503050702)	050702-1	Headwaters Stone Creek	Stone Creek	Forest, Agriculture	No	Shale, Sandstone	VRS	No	4.50	5.00	4.50	4.67	5.00	5.00	5.00	5.00					
		050702-2	Headwaters Little Swatara Creek	Little Swatara Creek, UNTs	Forest, Agriculture	Yes	Shale, Sandstone	VRS	No	3.00	3.50	3.50	3.33	5.00	4.50	5.00	4.83					
		050702-3	Middle Little Swatara Creek	Little Swatara Creek, UNTs	Forest, Agriculture	Yes	Shale, Sandstone	VRS	No	2.00	3.67	3.67	3.11	5.00	4.00	5.00	4.67					
		050702-4	Lower Middle Little Swatara Creek	Little Swatara Creek, UNTs	Forest, Agriculture, Residential	Yes	Limestone, Shale	VRS, VRC	No	3.75	3.75	3.75	3.75	5.00	3.67	5.00	4.56					
		050702-5	Eastern Headwaters UNTs to Little Swatara Creek	UNTs to Little Swatara Creek	Agriculture, Residential	Yes	Limestone, Shale	VRS, VRC	No	2.50	2.50	2.50	2.50	5.00	3.50	5.00	4.50					
		050702-6	Southeastern Headwaters UNTs to Little Swatara Creek	UNTs to Little Swatara Creek	Agriculture, Residential	Yes	Limestone, Shale	VRS, VRC	Yes	3.00	3.00	3.00	3.00	4.75	3.40	4.75	4.30					
		050702-7	Lower Little Swatara Creek	Little Swatara Creek, UNTs	Agriculture, Residential	Yes	Limestone, Shale, Graywacke	VRS, VRC	No	3.25	3.25	3.25	3.25	4.50	2.75	4.50	3.92					