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Setting

Paxton Creek is a small watershed at the state capital of Pennsylvania. The waterway forms in and flows through parts of four municipalities (Lower Paxton and Susquehanna Townships, Penbrook Borough, the City of Harrisburg), and touches upon Middle Paxton and Swatara Townships. Stormwater runoff from its 27 square miles drain to the Susquehanna River in the Chesapeake Bay watershed. It is a creek with 2 mouths and 7 arms (tributaries). This urban and suburban watershed carries twice the amount of certain nutrients and 15 times the sediment washed off a forested landscape. (Paxton Creek is among the highest sediment generators in the Middle Atlantic Region!)

Paxton Creek resources built early Harrisburg. In the watershed forests were cut to make lumber, farms produced food, flowing creek water ground grains and sawed logs, and clay became building bricks. Wetlands absorbed stormwaters. Various reaches of the creek served simultaneously as sewers, water supplies for industry, and recreation. Watershed people provided labor for business, government, and industry. For over 200 years Paxton Creek was the economic center and transport crossroads of the area. Paxton Creek supported dozens of industries from iron making to beer brewing, and experienced the consequences of erosion, water pollution, and diseases. With Paxton Creek as the industrial center, citizens were free to use the Susquehanna Riverfront for residences, amenities, and other purposes.

Paxton Creek was the destination of the Army of Northern Virginia, before the Confederates were stopped at Antietam and Gettysburg. Paxton Creek was a focus of work during Harrisburg's renaissance and the “City Beautiful Movement” in 1900-1915 as sewers, water filtration plants, asphalt roads, and parks were built. In an attempt to deal with floods, the creek's lower part was dammed and channelized. In subsequent decades industry and infrastructure waned, and Harrisburg lost population. Further creek decline occurred in the last half century, as farms were replaced by homes, businesses, and roads. Paxton Creek has become little more than a stormwater drain, and a conduit for floodwaters from the Susquehanna River, made worse by runoff from upstream communities.

Rivers Conservation Plan

The degraded condition of Paxton Creek provides tremendous opportunities. Its rehabilitation can improve the quality of life for all. Imagine a 50-mile green corridor to protect the creek, reduce pollution, process waste (at reduced cost), replenish well waters, enhance transportation, aid economic redevelopment, increase wildlife and natural habitat, soothe urban stress, and provide recreation within walking distance of homes in most neighborhoods. All this is possible with implementation of the Paxton Creek Rivers Conservation Plan (RCP).

The RCP has a limited three-part focus: 1) **protection of watershed resources**; 2) **remedies to watershed problems**; 3) **enhancement of watershed attributes**. These will be achieved by a 5-step process: identification of watershed issues, problems, and opportunities through an information baseline; formulation of plan goals and objectives; choice of criteria and indicators for making decisions, plan development and implementation; plan review, revisions, and updates. Essential to the RCP, now, are the information baseline, watershed goals, projects development, and plan implementation as oriented to the creek's 11 subwatersheds, focusing initially on two: Upper and Lower Paxton Creek North subwatersheds to launch the RCP. Figure 1.0 is a subwatersheds map.

The RCP employs scientific methods to collect and analyze data, and performs other planning tasks throughout its development, implementation, and afterwards. RCP information includes computer files, field records, reports, books, project blueprints, diagrams, drawings, photographs, and maps (paper and digital formats) from dozens of organizations and individuals. Twenty-five geographical information system (GIS) computer maps were created. PCWEA and partners reviewed existing information such as creek corridor conditions, demography, socio-economy, natural resources, and collected new data on subjects such as impervious surface, water quality, ordinances, land cover/land use, stakeholder attitudes and practices, and rehabilitation and pollution prevention opportunities. Most work was performed by professionals. College students and adult volunteers completed some tasks under professional guidance. The Appendix contains details on the methods and sources.

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Opportunities for public involvement in the planning process were many and diverse. In addition to planning workshops near the start (plan kickoff) and finish (projects prioritization), these opportunities included briefing meetings, website interactions, field activities (visioning meetings, stakeholder and landowner surveys), library displays, and a quarterly newsletter with articles about particular studies and status updates. A citizen's advisory group and a technical committee gave input. Educational materials were developed for plan implementation. One of these efforts, a brochure entitled *Are You Loving Paxton Creek To Death?* is attached to the RCP.

To achieve the PCWEA mission and improve communication, the RCP contains an educational chapter called Watershed Basics 101. This illustrated narrative will improve reader understanding of topics such as watersheds, the water cycle, creek flow, impervious cover (IC), water quality, pollution, and methods for remedying creek problems and enhancing creek attributes (Best Management Practices -- BMPs).

The RCP elaborates on several BMP categories, and nearly a dozen types of BMPs to be used in Paxton Creek watershed, particularly those that deal with water and land resources. These topics pertain to Paxton Creek's main problem: stormwater. Excessive IC causes stormwater runoff that sets in motion a dreary scenario: polluted waters cascades off roads, roofs, drive ways, and parking lots into Paxton Creek, which increase flows that erode creek banks, which generate sediment that chokes the creek and destroys wildlife homes by settling in creek pools and Wildwood Lake, thus reducing their capacity to store stormwater, and making flooding more frequent and worse downstream. And so on. Since the most effective water and land resource BMPs simulate natural processes, the RCP calls for extensive methods that reduce stormwater runoff, and enhance infiltration (soaking into the ground) in BMPs such as swales, rain gardens, bioretention areas, and reforestation where soils and vegetation capture and treat runoff (reduce volume, remove pollutants) before the runoff enters receiving waters. The land management approaches include retrofits of impervious surface and stormwater facilities, conservation landscaping, and low impact development techniques backed by municipal ordinances -- all for better stormwater management, water quality improvement, and other benefits.

Paxton Creek Baseline

Compiling the Paxton Creek baseline is similar to taking the watershed's pulse. It provides a broad range of information that is the foundation for the RCP. *The findings*:

- Five main issue categories account for 90% of the stakeholder interests (water, land, cultural resources; development; education with outreach)
- Watershed stakeholders support woodlands, open space, creek rehabilitation and protection, and they say they would pay modest taxes for watershed … improvements, but they oppose further commercial or light industrial development (revenue sources!) in the watershed
- Parts of the watershed have grown by leaps and bounds over the last half century (10X increase in Lower Paxton Township), while Harrisburg has lost half of its residents, population densities vary (2-5X greater in Harrisburg and Penbrook), and peoples of color are located mostly in one subwatershed
- During the last half century of sprawl and associated development impervious cover has vastly increased (currently 30% overall and between a 10-58% range among the subwatersheds)
- Stormwater runoff, the bane of the watershed, has eroded the creek to bedrock, toppled trees, and carries large quantities of sediment and other pollutants
- Surface water quality is fair to poor, generally worsening from upstream to downstream, and from forests to developed areas; about a quarter of Paxton Creek is on the DEP 303(d) list of waters impaired by sediment, nutrients, and/or fecal coliform bacteria pollution

Eroded to Bedrock

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Subwatersheds, Characteristics, Goals, Objectives and Strategies			
Themes/Goals	**Subwatersheds**	**Subwatershed Characteristics**	**Objectives and Strategies**
Protection Improve water quality; conserve and expand forest; protect open space, reduce erosion and sedimentation;	Black Run (BR) Linglestown (LT) Lucknow (LK) Mountaindale called Fox Run -- MT) Upper Paxton Creek North (Upper PCN)	Good macroinverte-brate communities 10-25% impervious cover (IC) Most have forest headwaters on natural landscape Suburban location	**C**onduct land conservation, water quality and infiltration retrofits; **P**erform Better Site Design and Low Impact Development principles in new watershed construction; **D**evelop riparian buffers with transfer/purchase development rights (T/PDRs) & conservation easements; **I**ncrease erosion and sediment controls;
Rehabilitation Improve water quality; rehab creek channels; reduce erosion & sedimentation; conserve and expand forest; enhance recreation;	Asylum Run (AR) Devonshire (DT) Paxtonia (PT) Lower Paxton Creek North (Lower PCN) Wildwood Lake (WL)	Fair or poor macroinvertebrate populations mainly reflecting habitat >25% IC Most have head-waters in developed areas Mostly urban	**I**mprove water quality via erosion & sediment controls, & IC retrofits; **R**ehabilitate stream channels; **C**onduct pollution prevention and awareness education; **D**etect wastewater discharges; **D**evelop miniparks and public trail system; **C**onstruct buffers with T/PDRs & conservation easements;
Enhancement Improve water quality; reduce stormwater runoff & floods; support urban redevelopment; conduct creek-based education; enhance trails and recreation; improve sewers.	Paxton Creek (PC)	56% IC Poor habitat and water quality for biota Channelized and concrete-lined stream Evidence of sewage discharges 31 combined sewer outlets with permits All urban	**D**etect and remediate discharges; **R**emove IC and overburden, and replace with soils and vegetation; **F**ocus on stewardship; **P**romote conservation landscaping and buffers; **E**ducate the public with creek and outdoor emphasis; **R**educe combined sewer outlets; **A**ctively encourage infill and redevelopment; **C**onduct awareness and pollution prevention education.

Adapted from Center for Watershed Protection (2004)

Only a few large tracts of undeveloped lands remain in the watershed center (Paxton Creek North subwatersheds), and on Blue Mountain
Vegetation and wildlife are fair to poor in most subwatersheds, with invasive plant species making up to a half of the terrestrial flora in some places
Additional threatened and invasive species were discovered in the RCP studies
Brownfield and floodplain sites may be threats to some improvement projects
The watershed depends upon inter-basin water transfers, from and to the river and a neighboring creek for domestic water and wastewater; groundwater can not supply current needs
In certain watershed areas the economy is lagging, and floods are increasing.

Goals

From the baseline the approach to Paxton Creek's revitalization becomes evident: emphasis on **protection** in some subwatersheds, **rehabilitation** of others, and **enhancement** of the most degraded all based on RCP goals (broad aims), objectives (tasks for reaching goals), and aspects of plan implementation to solve creek problems, protect resources, and enhance watershed attributes. Over 100 strategies (general approaches) and tactics (specific actions) are identified to help achieve the goals and objectives. Over 175 potential projects are also identified, and more than 25 are targeted to launch the plan and accomplish its initial phase. Most projects address multiple goals. The initial projects were prioritized by stakeholders. Their implementation is subject to approval or change by the PCWEA Board of Directors.

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The RCP has nine specific goals for the watershed: reduce *stormwater runoff and flooding*; improve *water quality*, decrease *channel erosion* and rehabilitate *creek reaches*; conserve and expand *contiguous forest*; protect *open space*, *mountain lands*, and large *undeveloped tracts*; support *urban redevelopment*; enhance *creek-based recreation*; perform *environmental education*; promote *watershed awareness, understanding*, and *stewardship*. Individual subwatersheds have additional goals with local emphases and priorities.

Projects

To achieve watershed goals the plan calls for ten types of projects (with improvement strategies): stormwater retrofit (modify existing IC, increase runoff infiltration and treatment), creek rehabilitation (stabilize banks, control grades, augment floodplains, expand in-stream habitat), riparian and upland reforestation (plant shrubs/ trees), flood controls (decrease runoff, increase stormwater storage, decrease floodplain encroachment, pollution source controls (increase education, enforcement of outdoor storage, yard practices, local infiltration), trails and recreation (enhance recreation, transport, commerce) via creek-based trails, miniparks, special facilities), habitat and open space protection (land deed covenants, conservation easements, subdivision ordinances); economic development (use creek as green infrastructure to assist commerce and industry), discharge controls (monitor, prevent, educate about, assist reduction of pollution), education (develop programs for increasing watershed awareness, stewardship, curriculum integration of school systems and others).

Implementation

A plan can go only so far. Actions taken to implement the RCP are just as important as its contents. Two types of considerations are involved: First are the technical and administrative components such as design, construction, inspection, maintenance, finance, component installation sequence. Second are the strategy and tactics for shepherding the RCP through bureaucratic and political processes.

The latter involve partnership building, funding arrangements, ongoing monitoring, evaluation, plan aftercare, project maintenance, education, and community outreach. Most important of all the considerations are the partners who help improve the watershed quality of life (and pick up pieces when efforts fall short). Although all stakeholders are important for success, the essential individuals and categories of partners are local (municipal and county) officials including Dauphin County Conservation District, regional organizations (CVI, SRBC), builders and trade professions, state and federal agencies (and politicians), environmental and conservation advocates, land owners and managers. The Appendix provides details for the RCP narrative on these topics

The integration of these components is necessary to achieve the RCP goals for Paxton Creek. It will be neither quick nor cheap. PCWEA and partners need to mobilize monetary and in-kind resources worth an estimated $12.4 millions over two decades (without more adjustments for the remaining partially-assessed subwatersheds). During the first phase of the RCP, $3.3 million will be needed, made up of $655,000 for operations, and $2.7 million for more than 25 projects. An RCP attachment describes 8 dozen plus implementation strategies and tactics to help watershed stakeholders do what is needed for this watershed of promise.