



Category 4b Plan

Hominy Swamp Restoration Plan

Wilson, North Carolina

November 7, 2018



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1 Impairment and Problem Statement

Hominy Swamp (NCDEQ Assessment Unit #27-86-8, HU #03020203020040) is located almost entirely within the city limits of Wilson, North Carolina (the City). Hominy Swamp is locally known as Hominy Creek given its current stream-like characteristics, but will be referred to as Hominy Swamp in this plan to be consistent with regulatory referencing. The water body is 9.85 miles long and has its confluence with Contentnea Creek downstream of Highway 264. It is located in the Neuse River Basin at the western limits of the coastal plain and has several surface water classifications as detailed in the following table.

Table 1-1 Surface water classifications

Classification	Surface Water Description
Class C	Waters protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner.
Swamp (Sw)	Supplemental classification intended to recognize those waters, which have low velocities and other natural characteristics, which are different from adjacent streams.
Nutrient Sensitive Water (NSW)	Supplemental classification intended for waters needing additional nutrient management due to being subject to excessive growth of microscopic or macroscopic vegetation.

Macroinvertebrate data was collected at two locations in Hominy Swamp in March 2001. One location was in Hominy Swamp upstream of Black Creek Road (State Route 1606) and the other was 3,000 feet downstream. A bioclassification of “Poor” was determined for the two locations. The State’s narrative standard for benthos is a bioclassification of “Good-Fair” or better; therefore, Hominy Swamp is not supporting an aquatic life designated use. The entire length of Hominy Swamp was listed in Category 5 (i.e., 303(d) list) of the State’s Water Quality Assessment Report in 2004 for impairment of its biological integrity. It has remained in Category 5 since 2004 with no additional impairment.

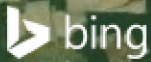
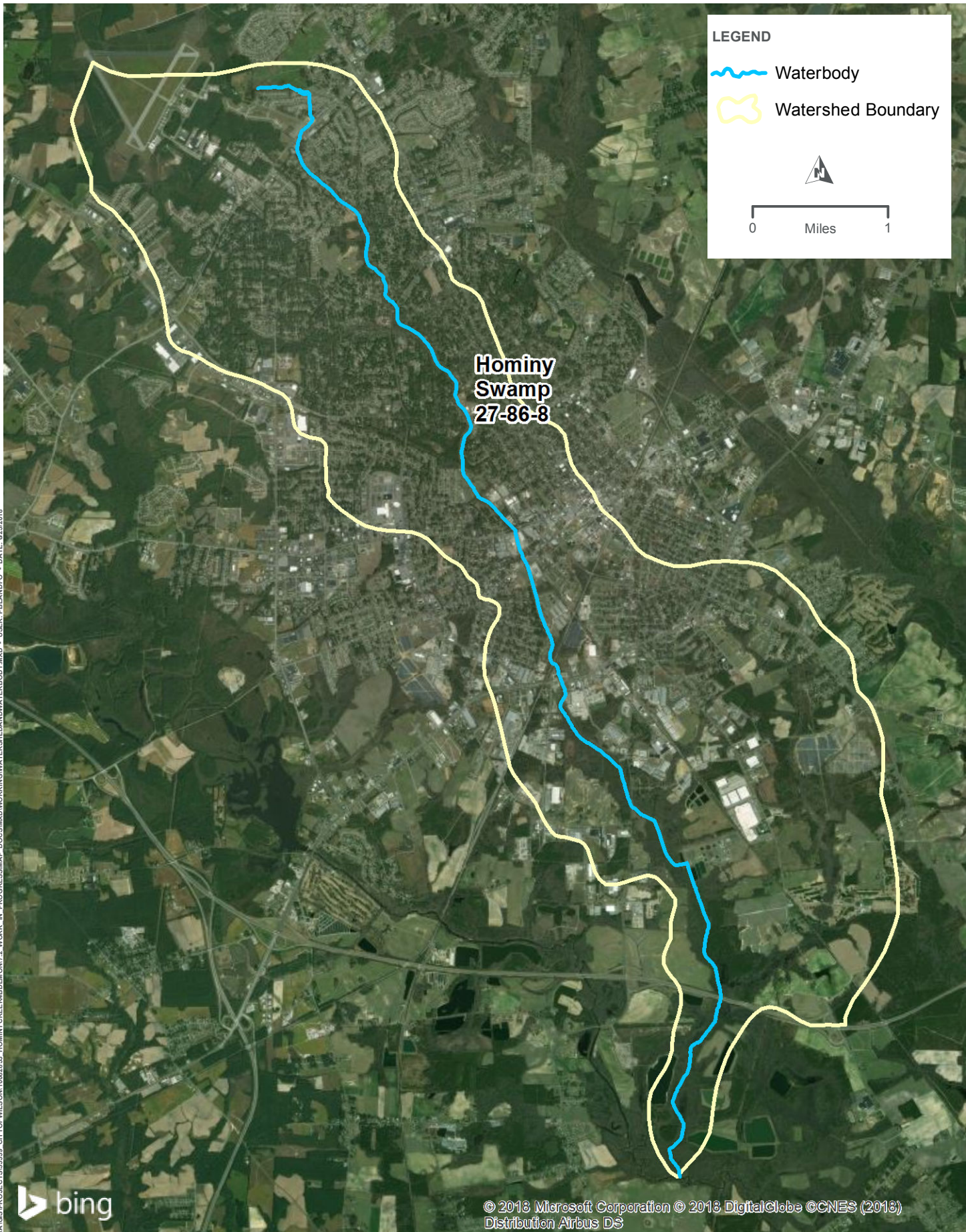
The early version of the State’s Integrated Reporting stated that the cause of impairment was likely urban runoff or storm sewers. In December 2004, the Ecosystem Enhancement Program (currently NC DEQ Division of Mitigation Services) authored a report titled Hominy Creek Watershed Assessment and Restoration. In this report, a number of water body stressors were identified, including:

- Impervious area contributing to significant fluctuations from base flow to peak flow
- Loss of riparian buffers beyond minimal widths that provide beneficial function
- Channelization of the water body resulting in erosion, sedimentation, and decline in benthic habitat

The City of Wilson, North Carolina is seeking re-categorization of Hominy Swamp from Category 5 to Category 4b on the State’s Integrated Water Quality Assessment Report through a demonstration effort. The City desires to develop and implement a water body restoration plan

(Plan) as part of a demonstration effort composed of pollution control strategies. The pollution control strategies will be selected to deliver progress towards reducing sources of pollution, managing runoff in a way to treat pollution prior to entering the water body, and improving the resiliency of the riparian corridor and watershed landscape in mitigating the effects of pollution. It is the City's intention that progress on these objectives will provide a foundation for macroinvertebrate recovery. A map of the watershed boundary and water body for Hominy Swamp is provided on the next page.

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WATERSHED AND WATERBODY MAP

2 Recovery Goal

The Recovery Goal of this Plan will be to achieve a Good-Fair rating of the State’s narrative standard for benthos. The foundation for the Recovery Goal is achieved by establishing conditions suitable for re-colonization of macroinvertebrates. The Plan proposes that these conditions, identified as the Plan objectives, will be improved through implementation of pollution controls. The following hierarchy figure provides a visual framework of how the Recovery Goal, Plan Objectives, and Pollution Controls support restoration.

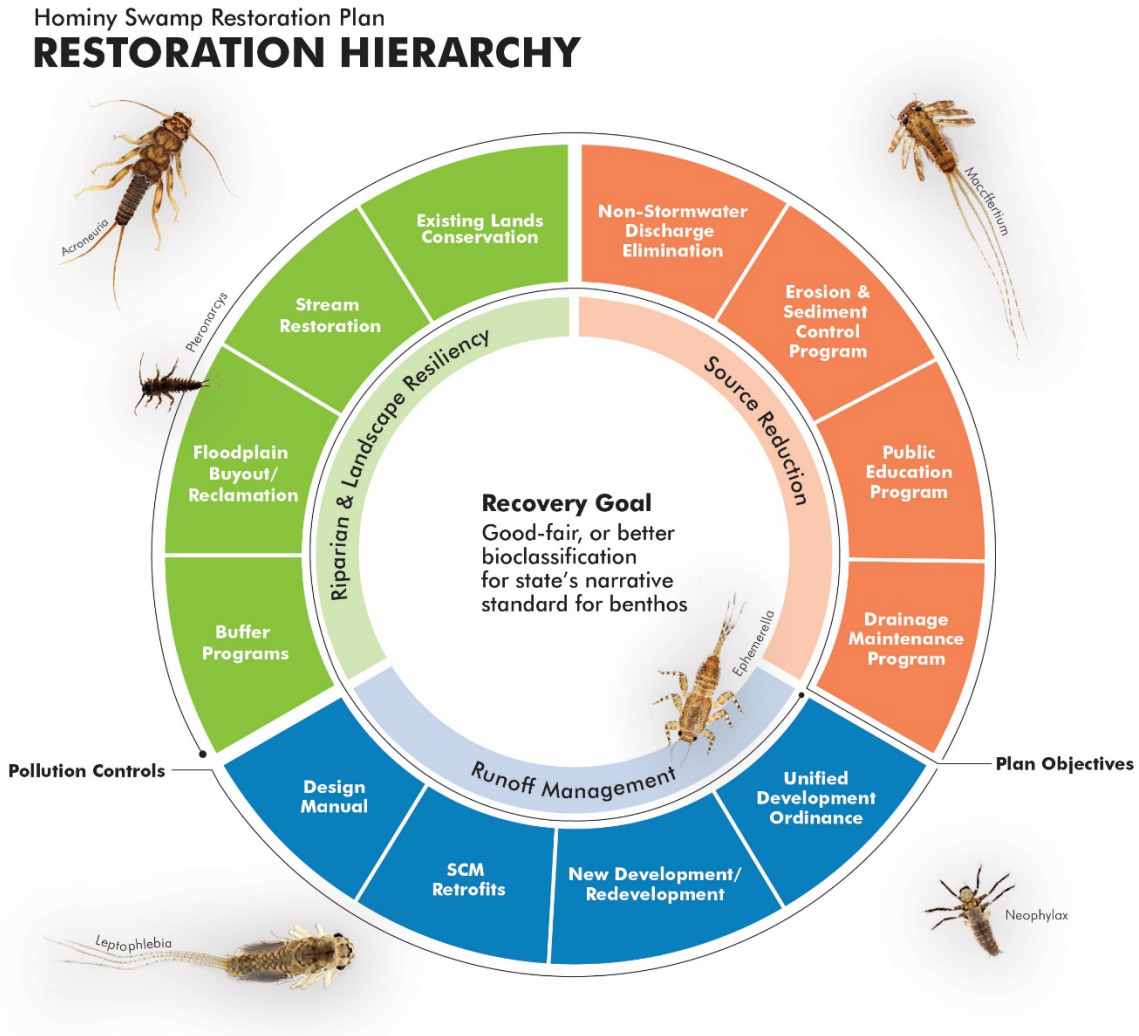


Figure 2-1 Restoration hierarchy

The Plan objectives include:

1. Source Reduction – The discrete discharge and mismanagement of pollution within the watershed has the potential to present toxic conditions that harm macroinvertebrate levels leading to short-term impairments. Historic and continual discharge of pollution in the watershed lead to chronic conditions that prohibit the re-colonization of the least

tolerant species evoking longer-term impairments. Reducing point source and non-point source pollution will protect existing macroinvertebrates and promote conditions conducive to improved macroinvertebrate taxa richness and abundance.

2. **Runoff Management** – Increases in the volume, rate, frequency, and non-point source pollution in runoff to streams affect the ability of macroinvertebrates to persist in suitable habitats for maintaining healthy colonies. Even with good water quality, frequent high energy runoff events can physically displace macroinvertebrates, destroy habitat and prevent the recovery of that habitat by natural processes. Stream bank erosion and subsequent sediment deposition resulting from elevated storm flows is particularly impactful to macroinvertebrate habitat. Better balancing of the stream energy through runoff management will minimize disruptions to macroinvertebrate ecology and improve the availability of suitable in-stream habitat.
3. **Riparian and Landscape Resiliency** – The watershed for Hominy Swamp is mostly developed and, as a result of that development, riparian corridors and floodplains have been modified. These modified landscapes, due to loss or degradation of natural features and processes, are less resilient in mitigating pollution and disruptions to macroinvertebrate ecology. Restoring the natural features and functions of these landscapes back to a more resilient condition should provide uplift for processes to recover and sustain.

Recovery of macroinvertebrates in disturbed or impaired system of this nature is subject to many variables, which make difficult the estimation of time to recovery. J. Bruce Wallace provides the following assessment on recovery steps and time to achieve recovery in the journal of Environmental Management (Volume 14, No 5, page 606).

Many studies of invertebrate recovery times from single event disturbances, such as toxic chemical spills, floods, pesticides, droughts, and organic pollution indicate recovery times of a few months to several years (e.g. Fisher and others 1982, Heckman 1983, Hynes 1960, Minshal and others 1983, Molles 1985). Other disturbances produce long-term changes in habitats and recovery will not occur until the natural habitat is restored. Such chronic disturbances may result in long-term changes in habitats and include contamination by toxic agents, physical changes in habitat, or changes in food resources available to consumers. When these variables are severely altered, changes in community structure may persist for decades.

Furthermore, functional recovery (i.e. abundances, biomass, or production of functional feeding groups), and taxonomic recovery (individual taxa or species) will not necessarily give the same time frames for restoration.

Considering this the degradation of Hominy Swamp has likely occurred as a result of “chronic disturbances” and “physical changes in habitat or food resources” more so than toxic events and therefore will take a commensurate or longer time to restore than that of the impairment. As such, the Plan proposes a time frame for meeting the Recovery Goal composed of two distinct phases. The first phase involves the implementation of pollution controls benefiting the Plan objectives of reducing source pollutants, managing runoff, and enhancing and preserving the

resiliency of the riparian and watershed landscape. The Plan proposes both short-term and long-term periods of implementation, which when established can be communicated as part of the progression towards the Recovery Goal; however, it is less known what period of time is needed to amass enough pollution control benefit for establishing conditions suitable for re-colonization. This understanding will be further refined with the adaptive management process.

The second phase involves the natural recovery process of macroinvertebrates (i.e. the period of macroinvertebrate re-colonization). Re-colonization is not well understood for Hominy Swamp at this point and is likely not to occur on its own volition until substantial progress has been made on Plan objectives. Even once pollution controls have been implemented and the Plan objectives have been progressed, the re-colonization period may take several years to decades to occur before it can be observed or measured for a positive trend. It is important to gain an understanding of the re-colonization process since re-colonization may occur in phases, such that recovery is in progress (e.g. functional recovery), leading up to the obtainment of a standard (e.g., taxonomic recovery). The City will develop an understanding of the re-colonization effort as part of the Plan implementation through a combination of periodic macroinvertebrate sampling, trend assessment in the biotic index, habitat score and taxa richness, and comparative analysis of non-impaired regional streams. This understanding will help to continually refine the time frame of meeting the Recovery Goal.

3 Pollution Controls Strategy

Implementing pollution control strategies will be an important component of restoring biological integrity in Hominy Swamp. The pollution control strategies identified in the sections below will help reduce the overall pollutant load, restore natural hydrology, or create more resilient systems that support ecological function. The pollution controls were selected from several existing programs, plans, and services provided by the City to its citizens either as part of a regulated program or provision of public services funded by the stormwater utility. The pollution controls provide a mixture of protective and restorative benefits towards the Plan objectives. Although Hominy Swamp does not exceed other water quality standards, the Recovery Goal will not be obtained by protective pollution controls alone, therefore, the City will adapt existing pollution controls and implement new pollution controls to have a restorative effect. The restorative pollution controls elicit action beyond regulatory requirements or typical level of services to create an uplift in water quality and macroinvertebrate habitat in pursuit of the Recovery Goal. Appendix A provides a summary of the supporting programs, plans, and services used for selection of pollution controls.

The following figure summarizes how the City evaluated pollution controls for implementation as part of this Plan with respect to the benefit it provides and course of implementation to be taken by the City.

- Pollution controls in the lower left quadrant are required as part of a regulatory program or current service of the stormwater program and may only maintain or protect the existing quality or condition of the Plan objectives. They will be continued as currently performed but will be evaluated for amendment periodically.
- Pollution controls in the lower right quadrant are currently in place and providing a protective benefit of the Plan objectives. They will be evaluated for enhancements to provide more restorative benefit either through improved implementation or application of the pollution control beyond regulatory limits.
- Pollution controls in the upper left quadrant do not currently exist in the context of this Plan so they will need to be developed. They will provide a protective benefit of the Plan objectives but require opportunistic implementation through land acquisition, partnerships, or special funding.
- Pollution controls in the upper right quadrant are a collection of existing and proposed controls that can provide restorative benefit when adapted or developed. They will also require opportunistic implementation.

Hominy Swamp Restoration Plan

POLLUTION CONTROL IMPLEMENTATION & BENEFIT

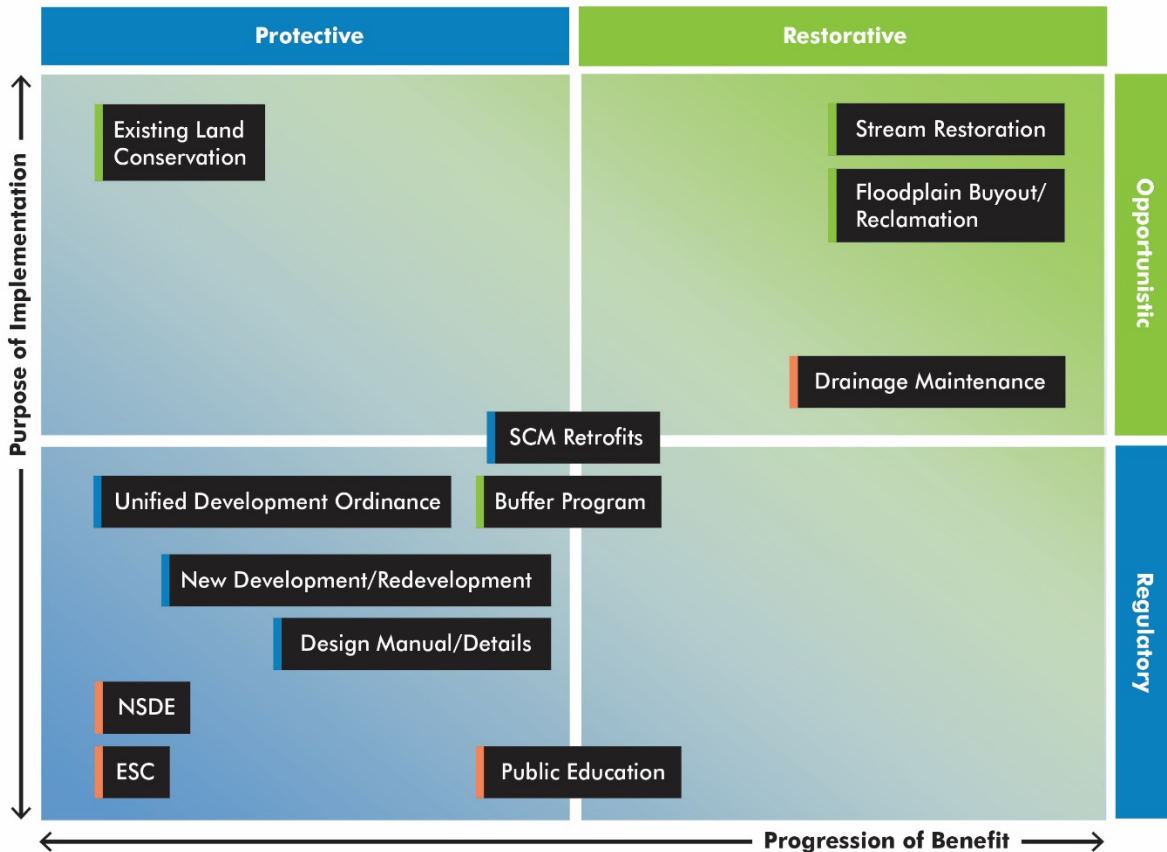


Figure 3-1 Pollution control implementation and benefit

3.1 Source Reduction

The following pollution controls limit the discharge of pollution into Hominy Swamp through the programmatic management of pollution sources, education of the public about pollution and its effect on the water quality and macroinvertebrates, and management of the drainage systems and its contribution to pollution. Benefits of these pollution controls mainly include protection and improvement of water quality. Most of the pollution controls are protective in nature while the Public Education and Drainage Maintenance Program will be adapted to support and provide restorative action to Hominy Swamp.

3.1.1 Non-Stormwater Discharge Elimination

The City performs a non-stormwater discharge elimination program in compliance with the Neuse River Water Quality Rules. The City will also administer a similar or the same Plan program as an EPA Stormwater Phase II community pending future designation. Their current program is proactive in identifying and eliminating non-stormwater discharges. It includes dry weather



screening of outfalls across the City over a ten year period. The City maintains a procedure for the screening and inspection of the outfall and surrounding area, a dry weather screening report form, and an up-to-date GIS inventory of outfalls. In addition, the City receives citizen initiated requests where discharges have occurred or are occurring. The City's Stormwater Compliance Specialist responds to these requests and initiates enforcement proceedings when a non-stormwater discharge is present. The City will continue the program currently in place and will evaluate operating procedures for amendments.

3.1.2 Erosion and Sediment Control Program

The City administers an Erosion and Sediment Control program in which any land disturbance in excess of one acre requires an erosion and sediment control plan to be developed, reviewed, and approved by City staff. The program was developed to comply with the North Carolina Sedimentation and Pollution Control Act and provide a locally responsive environmental service. In 2009, the program was extended to single family and dual unit housing below the State and federally mandated one acre threshold. This extension of coverage provides for the program to be administered most all regulated development in the City. In addition, there is oversight of the implementation of the erosion and sediment control plan to ensure protective measures are carried out as the plans calls out. In order to reinforce this effort, the City's erosion control inspector inspects sites periodically during construction to ensure that the erosion and sediment control devices are functioning as they are intended, particularly for projects with extensive grading. The City will continue the program currently in place and will evaluate the erosion and sediment control practices formalized in the Unified Development Ordinance and Manual of Specifications, Standards, and Design for amendments.

3.1.3 Public Education Program

The City performs a public education program in compliance with the Neuse River Water Quality Rules. As part of this program the City has been educating its citizens about the sources and effects of nutrients on local water bodies, both through personal and distributed media communication. The program has been expanded to cover a variety of stormwater management issues and utilize a variety of educational media. By engaging with the public through the use of utility bill inserts, television commercials, advertisements, and workshops, the City has increased local knowledge on buffers, post construction management, stewardship and engagement, and retrofits. The City will also administer a similar or the same program as an EPA Stormwater Phase II community pending future designation. The City will enhance this program to support restorative efforts in the watershed by establishing core messaging and content about this Plan for Hominy Swamp.

3.1.4 Drainage Maintenance Program

The City has a drainage maintenance program focused on maintaining, repairing, and improving engineered and natural assets within the City limits. The program has nearly all assets mapped and is working to assess condition and address problems. As part of this program, the City has performed stream bank stabilizations where they partner with property owners to repair eroding banks on private property. In addition, to this program the City developed a Stormwater Master Plan for Hominy Swamp in 2006 that focused on addressing issues related to flooding, erosion, and water quality. Several alternatives within the Master Plan are recommended for

implementation and when constructed will improve the operation and maintenance of the drainage system. The improvements will attenuate peak discharges, reduce flooding and erosion, provide for pollution removal, and enhance aquatic passage within the drainage system. The Drainage Maintenance Program is in the process of transitioning into a more holistic asset management program that will enhance the available solutions to include restorative improvements and maintenance, such as natural channel stabilization or daylighting alternatives. Improvements associated with the Drainage Maintenance Program will reduce pollution entering the system as a result of stream bank erosion and urban runoff but also have the potential to re-establish buffers and develop macroinvertebrate habitat. The City will adapt the program to support more restorative solutions to improving and maintaining the City's headwaters and drainage infrastructure system.

3.2 Runoff Management

The following pollution controls manage runoff from impervious surfaces in Hominy Swamp through the programmatic management of new development and standards and retrofitting of redevelopment and existing development to current standards. Benefits of these pollution controls include protection and improvement of water quality and restoration of balanced hydrology for Hominy Swamp. Most of the pollution controls are protective but will be evaluated to enhance their level of protection while the Stormwater SCM Retrofit Program will be adapted to support restorative action for Hominy Swamp. Furthermore, due to the amount of unmanaged runoff from past development in the watershed, broad application of these mostly protective pollution controls will have a restorative impact on Hominy Swamp.

3.2.1 Unified Development Ordinance

The City enforces a Unified Development Ordinance that contains provisions for Erosion Control, Flood Damage Prevention, Stormwater Management and Water Supply protection. These provisions are critical in establishing a legal framework of processes and tools to assist City staff in reviewing and guiding land development in a manner protective of the citizens, infrastructure, and the environment. In addition, the ordinance includes a variety of development bonuses that support the protection of open space and trees as well as promote the inclusion of green infrastructure type improvements (e.g. recessed bioretention parking medians). Additional amendments to the ordinance may be considered to establish other protective measures. The City will administer the ordinance currently in place and will evaluate the ordinance for amendments.

3.2.2 New Development/Redevelopment Stormwater Control Measures (SCM) Program

The City administers a program to manage runoff from impervious surfaces created by new development and redevelopment in compliance with the Neuse River Water Quality Rules. The City will also administer a similar or the same program as an EPA Stormwater Phase II community pending future designation. The program includes performance criteria and requirements for SCMs in new developments and redevelopments and ensures that stormwater is treated from new developments for both quality and quantity. Neuse River Water Quality rules limit the amount of nitrogen to be exported offsite, while Phase II rules will require a primary water quality SCM. Furthermore, Phase II rules and a local peak flow regulation require volumetric control of stormwater and reduction of peak discharges at prescribed percentages

below pre-development rates. The City will continue the program currently in place and will evaluate the elements of this program for amendments.

3.2.3 Design Manual/Details

The City maintains a Stormwater Design Manual and Details as part of its Manual of Specifications, Standards, and Design to help developers interpret and clarify the stormwater design guidelines of the City. This comprehensive resource provides developers with methods for addressing runoff management in order to comply with the City's guidelines for quantity and quality of stormwater coming from newly developed and re-developed sites. To further the effort of reducing peak flow, increasing stormwater infiltration, and reducing the amount of directly connected impervious area. The City will administer the document currently in place and will evaluate the design manual and details for amendments.

3.2.4 Stormwater SCM Retrofit Program

The City administers a program to identify potential sites for new stormwater SCMs in compliance with the Neuse River Water Quality Rules. The current strategy for implementing the SCMs is to utilize grant funding that is targeted toward nitrogen control to meet targeted counts of SCM implementation. Since Hominy Swamp watershed has largely been developed with no SCMs, increasing the number retrofit SCM projects with a focus on the volume of stormwater and range of pollutants treated will be an important component for the restoration of Hominy Swamp. Therefore, the City will increase the level of SCM retrofit identification and prioritize implementation of identified SCMs within the Hominy Swamp watershed. By increasing the amount of stormwater being conveyed to SCMs, the amount of non-point source pollution entering Hominy Swamp will be reduced. In addition, peak discharges and the volume of water discharging to the stream will be reduced due to attenuation, evapotranspiration, and infiltration helping to balance hydrology. The City will adapt the program to identify new and retrofit SCMs at an increased level beyond regulatory targets and consider more holistic SCM designs thereby customizing the management of runoff to support restorative action for Hominy Swamp.

3.3 Riparian/Landscape Resiliency

The following pollution controls protect and restore the natural features of the riparian and watershed landscape that mitigate non-point source and in-stream pollution through programmatic management and the retrofitting of critical lands (e.g. riparian corridors and floodplains). Benefits of these pollution controls include improvement of water quality, restoration of a balanced hydrology, and creation and maintenance of macroinvertebrate habitat. The Buffer Program and Existing Lands Conservation pollution controls are protective actions but the Buffer Program and the remaining pollution controls will be adapted to support restorative efforts.

3.3.1 Regulated Floodplain Buyout Process

The City administers a buyout process to buy and remove structures within the floodplain, and restore it to a pre-built upon condition utilizing both Federal Emergency Management Agency funding as well as local funding. The City utilizes local funding to buyout properties not eligible for FEMA funding. Floodplains provide areas for stormwater to be conveyed at moderate velocities and attenuate peak discharge rates due to their relatively wide and flat landscape. In

addition to increased storage and a decrease in obstructed flow area, floodplains also provide a water quality benefit in the form of reducing the sediment load in the stream. By reducing velocity in the stream, the likelihood of the stream incising and eroding will decrease, and the lower velocities will cause macroinvertebrate habitat to persist. Also, by removing structures and restoring the functionality of the floodplain, direct discharges from impervious areas are reduced and the management of stream banks and riparian vegetation is performed by the City. The reclaimed floodplain provides for a more resilient landscape to environmental forces and allows for reduced pollutant loading and increased pollutant processing. The process allows for the restoration of Hominy Swamp to a more resilient landscape to resist the effects of unmanaged runoff and mitigate against uncontrolled pollution, both of which impact macroinvertebrates. The City will continue the buyout process currently in place and formalize existing practices to provide for restoration opportunities involving stream and buffer restoration. This and other floodplain management policies and procedures originate out of the City's 2015 Floodplain Mitigation Plan.

3.3.2 Stream Restoration and Riparian Corridor Improvement Projects

Stream restoration provides for the application of natural channel design principles to uplift the holistic function of streams and riparian corridors. A restored stream or channel has the potential to reduce its contribution of pollutant loading from bank erosion, mitigate the impacts of unmanaged stormwater through geomorphic modification that complement its current hydrologic conditions, and provide natural habitat for macroinvertebrates. The introduction of sustainable materials, stream structures, and natural channel design increases the resiliency of the stream to weather extreme flow events and mitigate uncontrolled pollution. The City's 2006 Stormwater Master Plan for Hominy Swamp recommends several alternatives that will improve the condition and performance of the Hominy Swamp and its tributaries by reducing upsizing systems, reducing erosion and providing more storage for attenuation of peak discharges. In addition to the 2006 Stormwater Master Plan, the City developed a comprehensive plan for the restoration of a significant portion of Hominy Swamp titled Hominy Creek Greenway and Water Quality Park Master Plan. The City will develop an implementation strategy that couples capacity improvements from the Stormwater Master Plan with stream restoration components of the Greenway and Water Quality Plan to restore Hominy Swamp to a more resilient system to resist the effects of unmanaged runoff and mitigate against uncontrolled pollution. While the Greenway and Water Quality Plan provides a comprehensive restoration of Hominy Swamp, the implementation for this Plan will focus on the upper and lower portions where land acquisition is likely to be more attainable.

3.3.3 Riparian Buffer Programs

The City currently administers a program to protect riparian buffers in compliance with the Neuse River Water Quality Rules. The program focuses on education and protection of existing buffers by communicating to the public what riparian buffers are and their contribution to the environment. The City will also administer a similar or the same program as an EPA Stormwater Phase II community pending future designation. Riparian buffers provide a multitude of benefits to support healthy and resilient streams. In regards to water quality chemistry and runoff management, riparian buffers infiltrate runoff, filter pollutants, and regulate water temperatures. In addition, riparian buffers provide a sustainable matrix of vegetation that not only supports

ecological habitat, including macroinvertebrates, but also allows the channel to weather extreme flow events and mitigate non-point source pollution. Riparian buffers are one of the few pollution controls in this Plan that support all three Plan objectives. With much of the watershed already developed, there is little opportunity to protect existing riparian buffers beyond current regulations; however, the City will pursue riparian buffer restoration on headwaters through the aforementioned Drainage Maintenance Program and restoration on the main stem through projects coupled with the City's floodplain buyout process and stream restoration efforts. The City will adapt the riparian buffer program (and other associated opportunities) to provide more restorative opportunities for riparian buffers through increased implementation and focused riparian buffer design.

3.3.4 Existing Lands Conservation

In conjunction with the North Carolina Department of Environmental Quality's (NCDEQ) Watershed Master Plan for the area, the City is working to conserve existing lands from development; however, given the built out condition of the watershed, those areas are limited. The City will work to develop strategies to preserve open space. Strategies may include forfeiture of land or land acquisition. Increasing the amount of land protected within the watershed will limit the amount of impervious area in the watershed, as well as, limit increased pollution from human influence. In addition, land allowed to exist in its natural state provides for a more resilient landscape. The City will develop amendments to the current policy to support the proactive conservation of land that provides protective benefits for Hominy Swamp.

4 Schedule for Implementation

Implementation will occur over two sequential phases. The timeframe for the first phase of pollution control implementation will consist of short-term actions related to pollution controls that are already in place, have dedicated funding, or are regulatory or current level of service driven. The City will primarily formalize the aspects of these pollution controls into the implementation of this Plan or evaluate current policies and practices to adapt or enhance them to provide a more restorative benefit to the Plan objectives. These actions will be implemented in the first four years of the Plan.

The subsequent phase involves longer-term actions that involve pollution controls that will need to be developed with City and public stakeholder support, implemented in a manner involving opportunity or partnerships with property owners, or utilizing excess program funding or grants. These actions will be initially evaluated leading up to and implemented after the fourth year and performed up to recovery. The period of long term implementation will occur over a couple decades but will be refined as part of the adaptive management strategy.

Hominy Swamp Restoration Plan

POLLUTION CONTROL PHASING

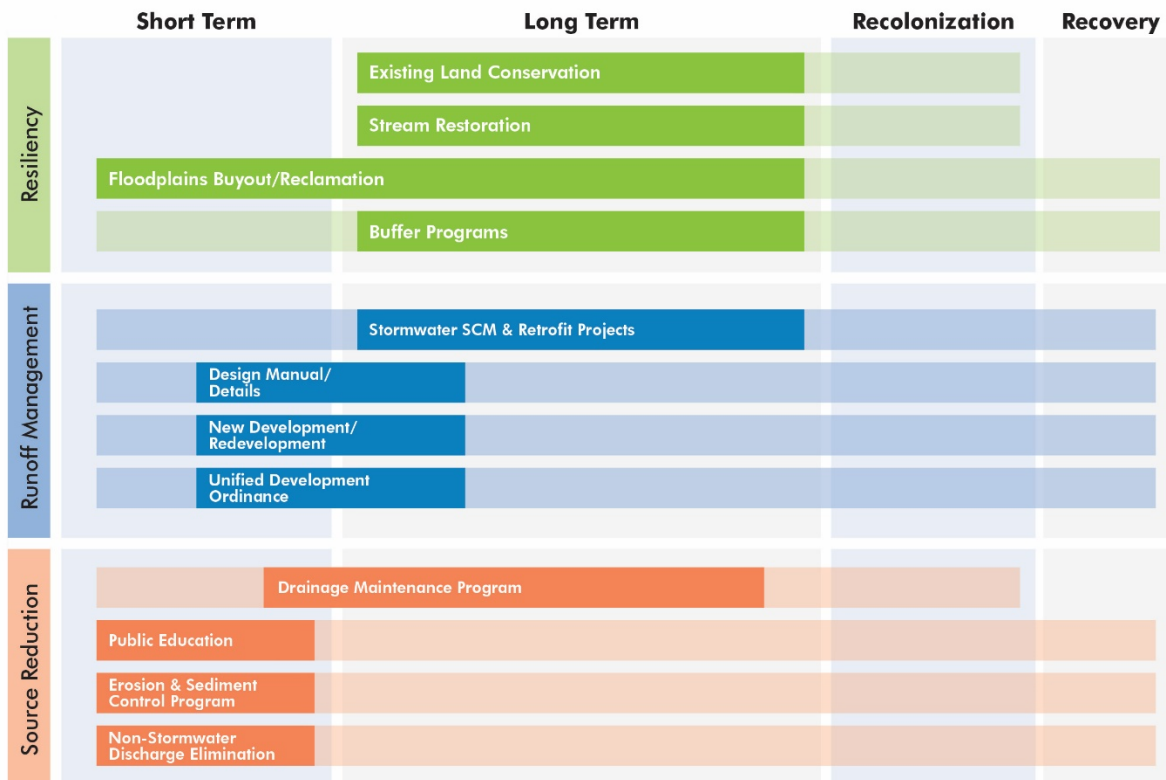


Figure 4-1 Pollution control phasing



Table 4-1 Source reduction pollution control strategy

	Pollution Control	Status	Goal	Implementation	Plan Objective	Benefit
Year 1	Non-stormwater Detection and Elimination	Existing	Continue for current benefit	Continue program currently in place but initially review for amendments	Source Reduction	Provides a protective benefit for benthic communities by identifying and eliminating non-stormwater discharges to receiving waters
	Erosion and Sediment Control Program	Existing	Continue for current benefit	Continue program currently in place but initially review for amendments	Source Reduction	Provides a protective benefit for benthic communities by reducing discharges of sediment to receiving waters
	Floodplain Buyout Program	Existing	Continue for current benefit	Continue program currently in place but initially review for amendments	Riparian and Landscape Resiliency	Provides a restorative benefit to benthic communities by reclaiming floodplain area for better management of high flows and reduces existing impervious area adjacent to stream corridors
	Public Education	Existing	Enhance for restorative benefit	Enhance public education content and messaging centered around restoration Plan	Source Reduction	Provides a protective benefit for benthic communities but enhancement will create greater community understanding, support, and involvement to implement the Plan for a restorative benefit.
Year 2	Unified Development Ordinance	Existing	Continue for current benefit	Continue administration of manual currently in place but initially review for amendments	Runoff Management	Provides a protective benefit for benthic communities by maintaining a variety of provisions to manage land development and protect natural features.
	New Development/Re-development Program	Existing	Continue for current benefit	Continue program currently in place but initially review for amendments	Runoff Management	Provides a protective benefit for benthic communities by requiring the management of runoff from new development and redevelopment.
	Stormwater Design Manual	Existing	Continue for current benefit	Continue administration of manual currently in place but initially review for amendments	Runoff Management	Provides a protective benefit for benthic communities by establishing standards of design to manage the impacts of runoff from developed land uses.
Year 3	Drainage Maintenance Program	Existing	Adapt for restorative benefit	Adapt program to provide for headwater drainage system improvements	Source Reduction	Provides a protective benefit for benthic communities but will be adapted to create solutions for improving headwater drainage systems to reduce pollution from streambanks and adjacent land uses for a restorative benefit.
Year 4	Stormwater Control Measures Retrofits	Existing	Adapt for restorative benefit	Adapt program to identify and implement more SCMs projects	Runoff Management	Provides a protective benefit for benthic communities but will be adapted to create more opportunities for SCM implementation and runoff management of existing developed areas for a restorative benefit
Year 5	Riparian Buffer Program	Existing	Adapt for restorative benefit	Adapt program to restore more buffers	Riparian and Landscape Resiliency	Provides a protective benefit for benthic communities but will be adapted to create more opportunities for riparian buffer implementation for a restorative benefit
	Stream Restoration and Corridor Improvements	Proposed	Develop for restorative benefit	Develop strategy to identify and construct stream restoration projects	Riparian and Landscape Resiliency	Provides a new restorative benefit through the implementation of stream restoration opportunities that provide more resilient natural system for supporting and maintaining benthic habitat
	Existing Lands Conservation	Proposed	Develop for protective benefit	Develop amendments to policy to support more land conservation	Riparian and Landscape Resiliency	Provides a new protective benefit through the conservation of existing lands in a natural or undeveloped condition.

5 Monitoring Strategy

The Plan will utilize a combination of monitoring strategies to assess the implementation and performance of pollution controls and their cumulative effect on meeting the overarching Plan objectives of source reduction, runoff management, riparian and landscape resiliency, and ultimately the Plan Recovery Goal. Effectiveness monitoring strategies will focus on documenting compliance in implementing pollution controls (if not quantifiable) and measuring their effectiveness (if quantifiable and not readily known). Effectiveness monitoring strategies may be utilized both in Hominy Swamp and its tributaries, as well as, offline on pollution controls and within the storm drainage system. They will be performed for short durations of time (i.e. synoptic) ranging from a single monitoring event up to about two years, and performed at a higher frequency throughout the Plan execution. Objective monitoring strategies will focus on establishing trends supporting progress towards meeting Plan objectives and the Recovery Goal. Objective monitoring strategies will be performed on Hominy Swamp and will be performed at lower frequencies than effectiveness monitoring, starting no sooner than a few years into the initiation of the Plan, up to meeting the Recovery Goal. NCDEQ's routine Biological Assessment and Ambient Monitoring programs provide a sufficient framework for meeting some of the long-term monitoring strategies.

5.1 Effectiveness Monitoring

5.1.1 Toolkit Compliance Statusing

Toolkit statusing will be used to demonstrate compliance in implementing pollution controls by indicating the simple performance or completion of them through the use of NC DEQ developed tools or City documentation. NC DEQ is in the process of developing a number of tools as part of a larger watershed restoration programming effort that may have relevance to this Plan. These tools will help Plan stakeholders identify issues within the watershed and document compliance towards addressing these issues with pollution controls in the Plan or actions inherent to resolving the issue. The City will utilize these tools to the extent they are relevant to addressing the impairment in Hominy Swamp and update online records with completed actions. NC DEQ will maintain an active accounting of the use of these tools through an online GIS portal for Hominy Swamp. The statusing will provide a snapshot of real-time Plan implementation for relevant pollution controls and can be used as part of the required annual reporting performed in an electronic manner.

5.1.2 Water Quality Sampling

The City will use water quality sampling or analytical sampling as an effectiveness monitoring strategy to provide a synoptic evaluation of the in-stream effects of a pollution control or determine the effectiveness of a pollution control with an unknown performance outcome. Sampling of water quality chemistry will establish that pollution controls for source reduction and runoff management are effective in reducing or eliminating a targeted constituent or surrogate constituent, such as total suspended solids.

The City will use water quality sampling where a pollution control's effectiveness is needed to demonstrate its continual use in the Plan or establish confidence that the pollution control

selected was effective in addressing the targeted constituent. For example, the City may perform water quality sampling in Hominy Swamp to gain confidence that a particular illicit discharge is the source of an observed concentration of constituent. Similarly, influent and effluent water quality sampling may be performed to establish the effectiveness of a new type of pollution control for runoff management. For each of these situations, the City will develop a brief water quality sampling plan document detailing the purpose and objective of the sampling.

5.2 Objective Monitoring

5.2.1 Flow Gauging

Flow gauging will provide a metric for capturing the benefit of the pollution control measures that focus on managing runoff and improving the resiliency of the riparian corridor and landscape, both in reducing or mitigating the pollutant loads, but also the volume and frequency of runoff. These pollution control measures through infiltration, volumetric retention and discharge attenuation, reduce the amount of runoff directly discharged or conveyed by Hominy Swamp, reduce stream energy, and balance storm flows with ambient flows.

The City of Wilson and the United States Geological Survey will be partnering to install a stream flow gauge on Hominy Swamp Creek. The gauge is being installed primarily to collect flow and stage data for the City's flood control program; however, storm and ambient flows provide a useful metric for evaluating the restored watershed's ability to emulate natural hydrologic function. This can be done by developing flow frequency duration curves that capture the frequency of the range of flows experienced in the water body. Despite not having a period of historic record on Hominy Swamp to evaluate progress, the Plan will focus on demonstrating positive trends away from the baseline curve to a more balanced curve. Flow gauging will primarily be used to evaluate long-term benefit of runoff management and riparian and landscape resiliency pollution controls.

5.2.2 Water Quality Sampling

The City will use water quality sampling or analytical sampling as an objective monitoring strategy to assess the drawn out benefit of more complex pollution controls or combinations of pollution controls. Sampling of water quality chemistry in this manner will establish that pollution controls from multiple Plan objectives are effective in providing benefit. This might entail monitoring dissolved oxygen or nutrients over a long period to demonstrate trends for improvement. For each of these situations, the City will complete a brief water quality sampling plan document detailing the purpose and objective of the sampling.

5.2.3 Macroinvertebrate Sampling

Macroinvertebrate sampling and analysis provides the only monitoring strategy for evaluating the Plan's performance in meeting the Recovery Goal. The State samples Hominy Swamp every other year for evaluating its use support in meeting surface water classification. The sampling is performed where Hominy Swamp passes under Black Creek Road (State Route 1606). Given the anticipated recovery schedule, the Plan will rely on the State's periodic macroinvertebrate sampling routine to evaluate trends in recovery. The City may at times perform macroinvertebrate sampling on smaller tributaries or the upper reaches of Hominy

Swamp to assess their condition in meeting the narrative standard. This may provide a means for reducing areas of implementation or evaluating the attained benefit of multiple pollution controls in meeting the Recovery Goal.

Data collection and habitat assessment towards meeting the State's narrative standard are subject to the swamp collection method given Hominy Swamp's Sw surface water classification. This method is required due to the probable occurrence of low or no flow during periods of the year. As such, data collection is performed in late winter (February to early-March) when flows are anticipated to be the highest. Data collection and habitat assessment to support intermediate evaluation of the implementation of the Plan or to demonstrate obtainment of the recovery goals shall be performed consistent with North Carolina's Department of Environmental Quality's Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrate (February 2016 Version 5.0 and future versions).

6 Adaptive Management and Commitment Statement

6.1 Adaptive Management Strategy

The City will utilize an adaptive management strategy to evaluate the Plan's performance in meeting the Recovery Goal for the purpose of revising pollution controls. The Plan has been developed with the following framework to support adaptive management.

1. Definition of Problem (Section 1 - Impairment Problem Statement)
2. Establish of Goals and Objectives (Section 2 - Recovery Goal)
3. Link Objectives with Selected Actions (Section 3 - Pollution Controls Strategy)
4. Implement Actions (Section 4 - Schedule for Implementation)
5. Perform Monitoring (Section 5 – Monitoring Strategy)
6. Analyze, Communicate Current Understanding, and Adjust (Section 6 – Adaptive Management)

As part of Step 6, the City will convene at two separate frequencies for two evaluation purposes. Annually, City staff involved in the implementation of the Plan will meet to discuss the City's performance in further refining pollution controls and implementing them. The City will mostly rely on the Effectiveness Monitoring program of Toolkit Compliance Statusing and Water Quality Sampling to 1) determine how effective they are in implementing pollution controls, and 2) how effective certain pollution controls are at meeting Plan objectives. The purpose of this meeting will mostly focus on lessons learned from the year of implementation, refinement of pollution control strategies, and forecasting the upcoming year's implementation and opportunities. It is not anticipated that amendments to the Plan will be performed as part of this meeting, particularly early on in the short-term period. Furthermore, this effort will support the development of the required annual report and communication of the current understanding of the problem.

City staff involved in the implementation of the Plan will meet first five years after the acceptance of the Plan and then meet every three years thereafter to evaluate progress towards Plan objectives and the Recovery Goal. The City will evaluate the Objective Monitoring program data sets for long term trends supporting the Plan objectives, as well as, perform a more comprehensive review of the Toolkit Compliance Statusing results to identify trends in implementation efforts. The City will also compare the Plan performance with data from the North Carolina Department of Environmental Quality monitoring programs. The purpose of this meeting will result in decisions to continue, revise, or stop the implementation of certain pollution controls and consider the re-balancing of effort as it relates to Plan objective results and Plan phasing. Decisions will be recorded with justification and communicated as part of the annual report as well as archived with the Plan.

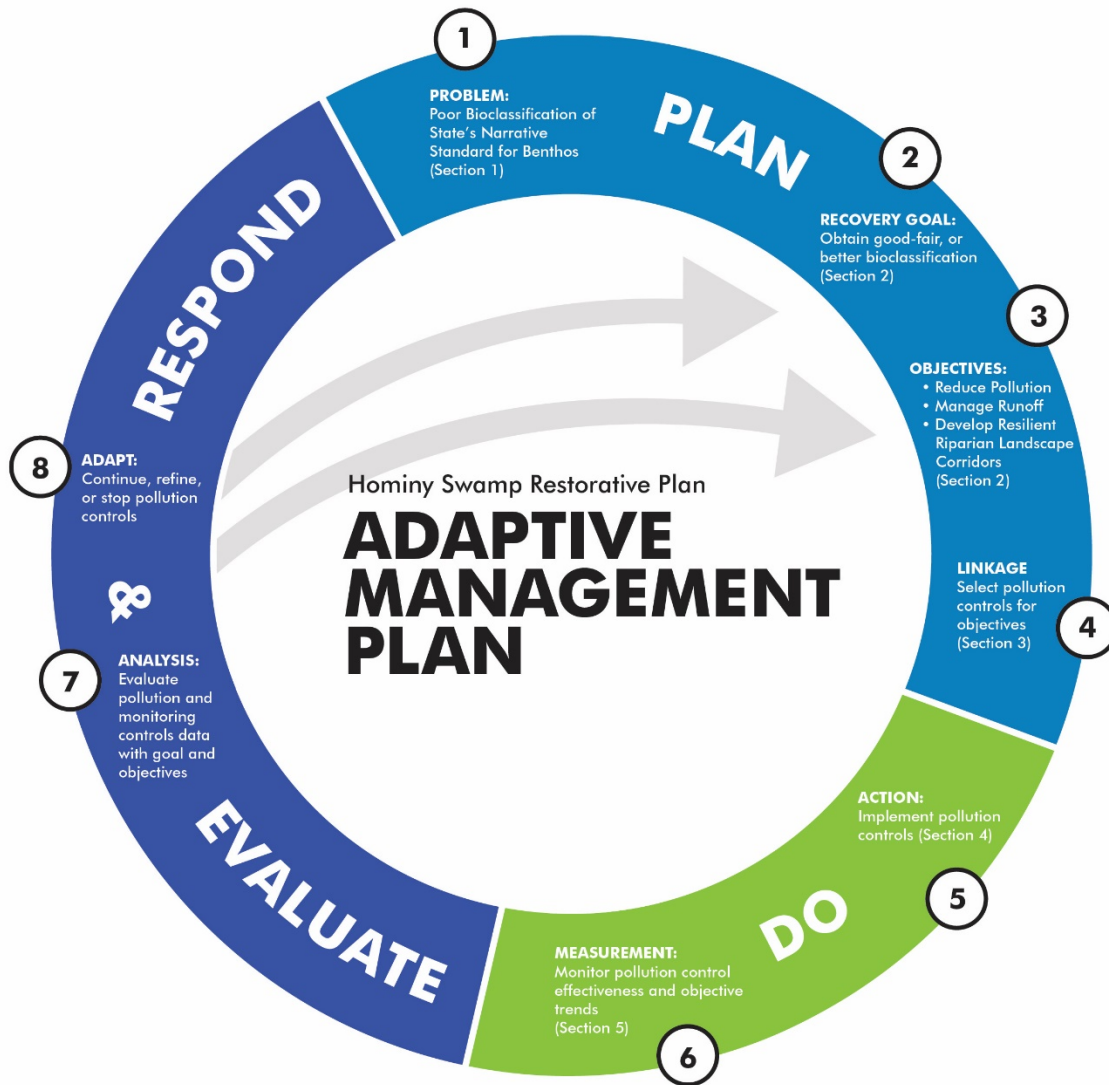


Figure 6-1 Adaptive management plan

6.2 Plan Legacy and Reporting

The City intends to align with trends towards electronic reporting and the elimination of redundancy in reporting. In doing so, the Plan will be minimally amended except for significant deviations and adjustments. Instead, the City will issue separate electronic reporting of Plan decisions to be archived with the original or recently updated version of the Plan.

It is the responsibility of the City to provide to the North Carolina Department of Environmental Quality an annual report demonstrating their conformance to this Plan. The City intends to leverage reporting technologies and consolidation afforded by the Department, including online and cloud-managed Toolkit Compliance Statusing consolidation of annual reporting for Neuse

River Nutrient Strategy and NPDES Phase II MS4 (when required) where practical. The City will coordinate with NCDEQ staff to set up the reporting protocols.

6.3 Commitment Statement


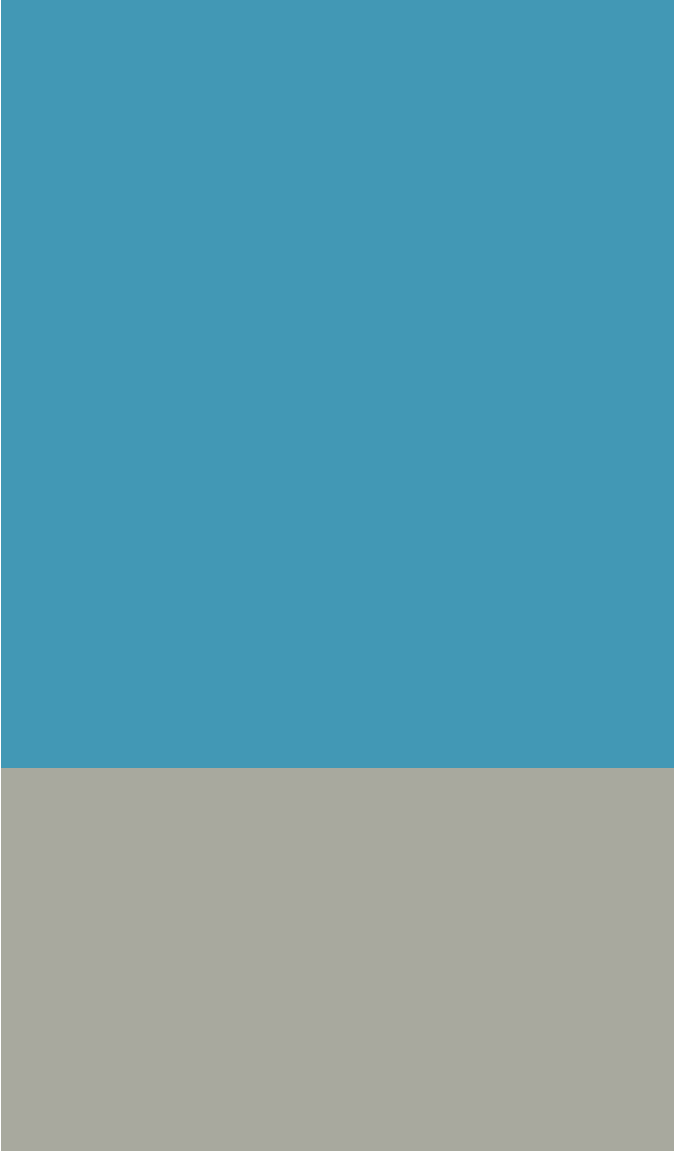
This Plan outlines a strategy to meeting the water quality standard of a Good-Fair or better rating of the State’s narrative standard for benthos for Hominy Creek Swamp (i.e. Recovery Goal). The Plan and implementation of it provide a demonstration effort on behalf of the City towards meeting the Recovery Goal, as an alternative to Total Maximum Daily Load (TMDL) development. The Clean Water Act affords agencies the deferment of TMDL development where “other pollution control requirements (e.g., best management practices) required by local, state or federal authority” are stringent enough to implement applicable water quality standards within a reasonable period of time (40 CFR 130.7(b)(1)). It’s the City’s intention that this Plan be considered under this clause and that Hominy Swamp be categorized from Category 5 to Category 4b on the State’s Integrated Water Quality Assessment Report, with approval from the North Carolina Department of Water Resources and Region 4 of the United States Environmental Protection Agency.

In April 2016, the City’s Stormwater Advisory Board presented to the City’s Council several recommendations regarding the City’s stormwater program in support of increased stormwater utility revenue. One of these recommendations was the request by the Advisory Board to pursue a Category 4b demonstration project for Hominy Swamp. The development and ongoing implementation costs of the plan and schedule for development were discussed with the City Council. As part of the overall program and funding discussion, the Council subsequently approved the Advisory Board’s request for funding. Stormwater staff acted in 2017 to secure a consultant to develop this Plan as a Category 4b demonstration project. The implementation of the Plan is supported by the programs and projects currently developed or under-development and funded by revenue generated by the City’s stormwater utility.

A letter of commitment from the City Manager accompanies this Plan.

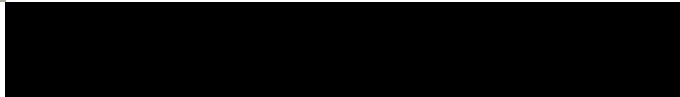


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A

Appendix A – Supporting Documents and Programs



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Supporting Documents and Programs

Neuse River Nutrient Sensitive Waters Program for Stormwater

In 1997, the North Carolina Department of Environmental Quality (NCDEQ) set the Neuse nutrient strategy into place to reduce the pollution from nutrient runoff. The goal of the strategy is to remove the Neuse estuary from the North Carolina 303(d) list of impaired waterbodies by regulating the nutrient loading in the wastewater, stormwater and agricultural runoff. The strategy also outlines protection of riparian buffers and training for applying fertilizer to land. With the implementation of this strategy, the state hopes to reduce nitrogen by 30% based on the levels in 1995. A component of the strategy includes a model Stormwater Program for Nitrogen Control, which is codified in the Neuse River Rules. This program includes elements of new development runoff management, illegal discharges, retrofits, and public education.

Hominy Swamp Master Plan

In 2006, the City of Wilson (the City) prepared a Stormwater Master Plan (SWMP) to identify flooding, erosion and water quality issues in the Hominy Swamp watershed. The purpose of the plan was to identify and provide recommendations for addressing problems in the watershed associated with flooding, erosion, and water quality. Various watershed modelling was performed for the plan to support assessment of issues and development of solutions. The SWMP came up with a list of alternatives to mitigate the present stormwater issues. The alternatives included increasing pipe capacity, modifying outlet control, and incorporating additional floodplain storage. While these improvements were mostly focused on reducing the risk of flooding to roadways and structures, the improvements involve components or have beneficial impacts to the riparian corridor. These improvements will reduce stream velocities and erosion, attenuate peak discharges, and provide floodplain storage or retention time, which all have an effect on reducing the short term impact associated with storm events. It is also anticipated that replacement of culverts and other structures will be evaluated for water quality and aquatic habitat and passage considerations. In addition, a water quality analysis was performed that identified subbasin level pollutant loading for nitrogen, phosphorus, lead, and zinc.

Hominy Creek Greenway and Water Quality Plan

In 2016, Wilson City Council adopted the Hominy Creek Greenway and Water Quality Park Master Plan. The goal of this plan is develop a greenway along Hominy Swamp Creek and incorporate stream restoration and water quality best management practices (BMPs) as part of the implementation in order to better manage stormwater runoff into the creek and create habitat for macroinvertebrates with the creek. By doing these actions, City hopes to further the restoration of benthic communities in Hominy Swamp Creek and remove it from the 303(d) list of impaired waterbodies. This conceptual plan maps out recommendations for City to reach this goal. These include protection of riparian buffers, additional BMP implementation, analysis of roadway crossings, and protection of natural resources. This plan also proposes a recreational and educational aspect to showcase Hominy Swamp Creek and the City of Wilson.

Floodplain Mitigation Plan

In 2015, the City of Wilson adopted a Floodplain Management Plan. This plan identifies actions that will help to prevent future flooding, stream bank erosion, and dam failures. This plan was made up of four goals: 1) protection of health and safety; 2) reduction of flood damage through flood resilient strategies and measures; 3) reduction of damage to insurable buildings and frequently flooded areas; and 4) protection of critical and essential facilities from flood damage. With these four goals in mind, the plan mapped out potential remedies to the existing concerns and prevention strategies for future issues. Property acquisition in the floodplain is considered to be critical strategy of the plan, which provides the City the opportunity to reclaim these areas and retrofit them back to natural or improved conditions to support local goals.

NPDES MS4 Phase II Program

The NCDEQ Municipal Separate Storm Sewer System (MS4) Phase II Program began in 2006 to provide regulatory administration of the 2006 stormwater bill and the federal promulgation of the NPDES MS4 stormwater program. The purpose of the program is to regulate stormwater discharges from MS4s by permit to the maximum extent practicable. The federal government established a framework of six minimum measures to do this: 1) Public Education and Outreach, 2) Public Involvement and Participation, 3) Illicit Discharge Detection and Elimination, 4) Construction Site Runoff Control, 5) Post Construction Runoff Management, and 6) Pollution Prevention/Municipal Housekeeping. North Carolina, through the MS4 permit, requires BMPs to be performed for these six minimum measures. The City is not subject to these regulations at this time but anticipates to be designated as their population increases.



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