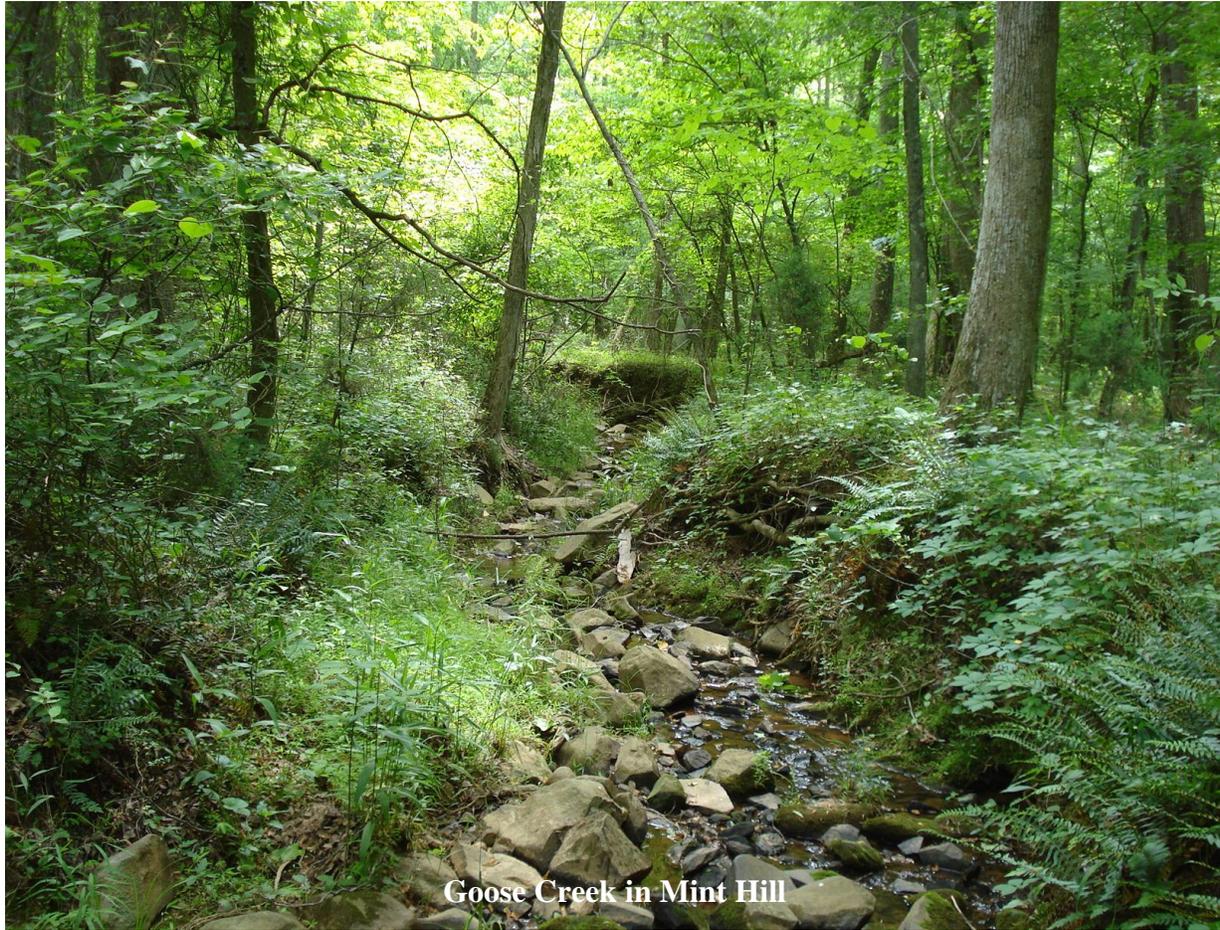




Charlotte-Mecklenburg Water Quality Buffer Implementation Guidelines



**For Use in the City of Charlotte, Mecklenburg County and the Towns of
Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville**

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Compiled by Charlotte-Mecklenburg Storm Water Services



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Section 1 Introduction

1.1 Purpose

The purpose of this document is to provide information regarding the different water quality buffers that exist in Charlotte-Mecklenburg and the various ordinance requirements regarding their protection. In addition, this document will describe the process that must be followed to request approval to disturb a water quality buffer and the actions necessary to restore buffers that have been impacted due to noncompliance with ordinance requirements.

1.2 Background

Water quality buffers are naturally vegetated areas adjacent to a water body that serve the following functions:

- protect water quality by filtering pollutants contained in the storm water runoff;
- allow water to soak into the ground and recharge groundwater supplies;
- provide storage for floodwaters;
- allow channels to meander naturally;
- provide suitable habitats for wildlife;
- provide shade to reduce water temperatures; and
- provide soil stability through root mass.

Storm drain pipes end at the edge of the buffer and energy dissipaters are installed at the outlets to diffuse storm water flow and facilitate pollutant removal (see Figure 1).

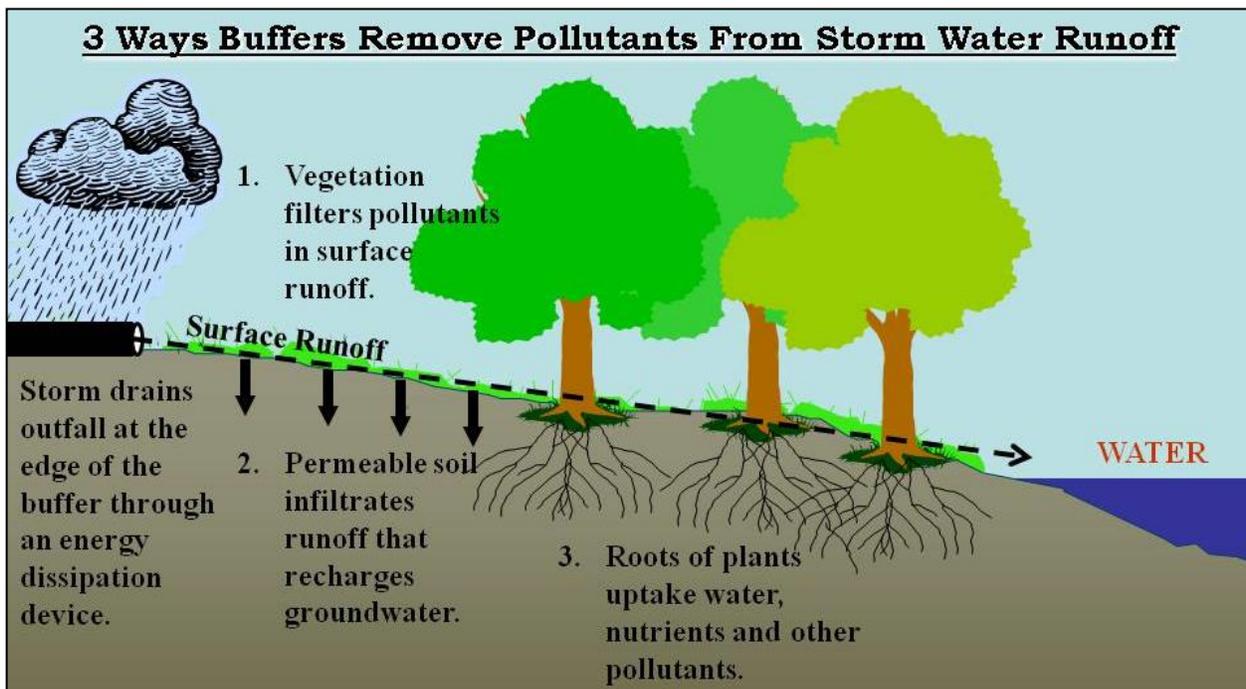


Figure 1: How a Water Quality Buffer Works to Filter Pollutants



Four (4) different types of water quality buffers exist in Charlotte-Mecklenburg as required by various ordinances adopted by Mecklenburg County, City of Charlotte and the six (6) Towns between 1993 and 2008. The buffer requirements differ slightly based on jurisdiction and buffer type. In 1993, the first water quality buffers were established along the streams and lakes located in the drinking water supply watersheds draining directly to the Catawba River in western Mecklenburg County. These buffers were developed to protect the drinking water supply reservoirs along the Catawba, including Lake Norman, Mountain Island Lake and Lake Wylie. In 1999, the Surface Water Improvement and Management or S.W.I.M. buffers were established along all the streams in Charlotte-Mecklenburg. The purpose of these buffers was much more encompassing and included the buffer functions listed on the previous page. S.W.I.M. buffers were the first to be applied county-wide. In 2007 and 2008, the post-construction storm water ordinances were adopted that require 30-foot buffers with no built-upon area along streams with smaller drainages not covered by S.W.I.M. In addition, some buffer widths were increased under post-construction and the Goose Creek and Six Mile Creek buffers were established, which are the largest and most restrictive buffers in Charlotte-Mecklenburg. Each new buffer ordinance that was adopted added to the previous buffer requirements, which were allowed to remain in the local ordinances. This was done to ensure that there are no gaps in the buffer coverage due to grandfathering. For example, the S.W.I.M. buffers were left intact when the post-construction buffers were adopted so that developments grandfathered under post-construction would in most cases still be required to comply with the S.W.I.M. buffers. In all situations where two (2) or more buffer types apply to the same stream segment, the buffer that is more protective of water quality will apply. Provided below is a summary of the four (4) different buffer types in Charlotte-Mecklenburg.

1. Water Supply Watershed Buffers – The water supply watershed buffer requirements went into effect in the City of Charlotte, Mecklenburg County and the Towns of Davidson, Cornelius and Huntersville between 1993 and 2001 through the adoption of water supply watershed rules as part of the respective jurisdictions' zoning ordinances. These buffer requirements apply to the shoreline of the Catawba River lakes and the perennial streams that drain to them, as well as the ponds they intersect, as delineated by a solid blue line on the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). Appendix 1 contains a map illustrating the areas of Charlotte-Mecklenburg subject to the water supply watershed buffer requirements. The purpose of these buffers is to protect the public water supplies in Lake Norman, Mountain Island Lake, and Lake Wylie and to comply with the N.C. Water Supply Watershed Classification and Protection Act (NCGS 143-214.5). These buffers do not have zones and are to be left predominantly undisturbed. They vary in width from 30, 40, 50 and 100 feet or the entire 100-year floodplain depending on the density of the development and its location in the watershed. Appendix 2 provides an overview of the water supply watershed buffer requirements in a tabular format.
2. Surface Water Improvement & Management (S.W.I.M.) Buffers – The S.W.I.M. buffer requirements went into effect in all the jurisdictions in Charlotte-Mecklenburg between 1999 and 2000 through the adoption of the S.W.I.M. buffer rules as part of the respective jurisdictions' zoning ordinances. These buffer requirements apply to the streams and the ponds that they intersect in Charlotte-Mecklenburg and not to the shoreline of the

Catawba River lakes. S.W.I.M. buffers apply to intermittent and perennial streams that drain ≥ 100 acres in the City of Charlotte, Mecklenburg County and the Town of Pineville. S.W.I.M. buffers apply to streams draining ≥ 50 acres in the Towns of Cornelius, Davidson, Huntersville, Matthews, and Mint Hill. The purpose of these buffers is to filter pollutants, store floodwaters, provide habitat, and contribute to the “green infrastructure” within Charlotte-Mecklenburg. S.W.I.M. buffers in all jurisdictions except the Town of Cornelius are divided into three (3) zones with varying restrictions, including the stream side zone (located immediately adjacent to the water body with no disturbance allowed), managed use zone (located adjacent to the stream side zone with minimal disturbance allowed), and upland zone (located adjacent to the managed use zone with clearing and lawns allowed). S.W.I.M. buffers in the Town of Cornelius do not have zones and are to be left undisturbed. All S.W.I.M. buffers vary in width depending on the size of the upstream drainage area. The width of the zones within these buffers also varies. Appendix 3 provides a summary of the S.W.I.M. buffer requirements in a tabular format.

3. Post-Construction Buffers – The post-construction buffer requirements went into effect on June 30, 2007 in Mecklenburg County and the six (6) Towns, and July 1, 2008 in the City of Charlotte, through the adoption of post-construction ordinances contained in either the respective jurisdictions’ existing zoning ordinances or their City Code. These buffer requirements apply to intermittent and perennial streams and the ponds that they intersect in Charlotte-Mecklenburg and not to the shoreline of the Catawba River lakes. Buffer requirements vary based on established post-construction districts. Appendix 4 contains a map that illustrates these districts. The purpose of these buffers is to establish storm water management requirements and controls to prevent water quality degradation to the extent practicable and to comply with Phase I and Phase II Storm Water Permit requirements (NCGS 143-214.7). In general terms, post-construction buffers are an expansion of the S.W.I.M. buffer requirements, but in several jurisdictions and watersheds these buffers go significantly beyond the requirements established by S.W.I.M. Appendix 5 provides an overview of the post-construction buffer requirements in a tabular format.
4. Goose Creek and Six Mile Creek Buffers – The Goose Creek buffer requirements went into effect on February 1, 2009 for intermittent and perennial streams and the ponds that they intersect in the Goose Creek Watershed in the Town of Mint Hill. They are currently administered by Mecklenburg County under delegated authority from the N.C. Environmental Management Commission. The Six Mile Creek buffer requirements went into effect with the adoption of the City of Charlotte’s post-construction ordinance on July 1, 2008 and apply to intermittent and perennial streams and the ponds that they intersect located in the Six Mile Creek watershed. The Six Mile Creek buffers are administered by Charlotte Storm Water Services. The Goose and Six Mile Creek buffers are incorporated into the Town of Mint Hill and City of Charlotte post-construction ordinances, respectively. These buffers are distinguished by the fact that both exist for the protection of the Carolina heelsplitter, which is a federally-endangered species of freshwater mussel. Disturbances are not allowed in these buffers unless specifically



listed in the “Table of Uses” contained in Appendix 6. Appendix 5 provides an overview of the Goose and Six Mile buffer requirements in a tabular format.

The widths of the four (4) buffer types described above vary significantly throughout Charlotte-Mecklenburg. Refer to Appendices 2, 3 and 5 for the buffer widths associated with the different buffer types. One similarity shared by all stream buffers in Charlotte-Mecklenburg is that their widths are measured horizontally on a line perpendicular to the stream, landward from the top of the bank on each side of the stream. The widths of the lake buffers contained in the water supply watershed rules are measured in the same manner but the measurement originates from the full pond elevation of each reservoir and not the top of the bank (see Section 2.1.3).

Water quality buffers are protected to varying extents depending on the type of buffer as described above and the jurisdiction where it is located. For all buffer types, new structures are not allowed in the buffer, including outbuildings, septic systems, home expansions, swimming pools, etc., except gazebos and storage buildings are allowed in the upland zone of S.W.I.M. buffers provided they are for non-commercial use and do not exceed 150 square feet. In addition, existing trees are to remain in place for most buffer types with a few exceptions in S.W.I.M. and post-construction buffers. Section 4 contains additional detail regarding the allowable water quality buffer disturbances.

Section 2 Applicability

2.1 Determining if a Water Quality Buffer Applies to a Parcel of Land

The best tool currently available for determining if a buffer requirement **might** apply to a particular parcel is the Property Ownership and Land Records Information System or POLARIS 3G located at <http://polaris3g.mecklenburgcountync.gov/>. POLARIS is an interactive mapping system available on the Internet that works by accessing and retrieving maps and GIS data layers associated with real property in Charlotte-Mecklenburg. Mecklenburg County’s GIS Department developed and maintains the system. Figure 2 provides a sample of the buffer coverage available in POLARIS. By following the steps described below, POLARIS can be used to access data layers and maps for a particular parcel for determining if a water quality buffer requirement may apply.

1. Enter Parcel ID # or address and depress Enter (upper left side of screen).
2. Select “Overlays” (upper right side of screen).
3. Select “Water Quality Buffers (SWIM)” and “Post Construction Buffers” (left side of screen).
4. Select “Legend” (upper right side of screen) to identify the type of buffer indicated on the parcel as illustrated in Figure 2 below.

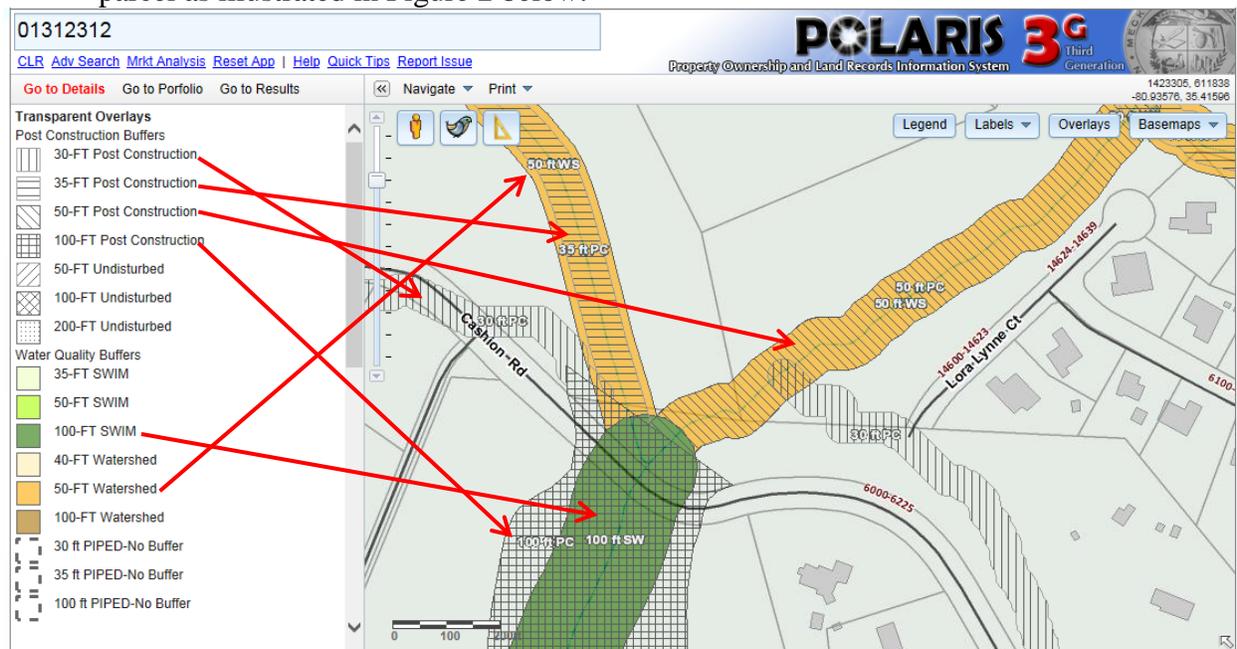


Figure 2: Identifying the Type of Buffer Using POLARIS

A parcel that is indicated in POLARIS as having a water quality buffer may or may not be subject to buffer requirements under the law. The **final** determination regarding the application of a water quality buffer to a parcel of land should be made utilizing the following three (3) steps as described further in the proceeding subsections:

1. Review of the applicability and exemption sections of the applicable ordinance(s);
2. Delineation of the stream and/or lake shoreline; and

3. Delineation the buffer area on the ground around the stream and/or lake shoreline

2.1.1 Applicability of Governing Ordinances

The four (4) different buffer types have different requirements regarding their application to a parcel of land. In addition, the application of the four (4) buffer types differs depending on the jurisdiction where the parcel of land is located. Appendix 7 provides a summary of the applicability and exemption requirements for the different buffer types by jurisdiction; however, it is extremely important to review the actual ordinance language to make a final determination. Information is provided below to facilitate access to the ordinances for the four (4) buffer types.

1. Water Supply Watershed Ordinances – Refer to the Zoning Ordinance for the jurisdiction where the parcel of land is located and review the “Applicability” section under the appropriate “Watershed Overlay District.” For example, if the parcel is located in the Mountain Island Lake Watershed in the Town of Huntersville you would review the Applicability Section of the Mountain Island Lake Watershed Overlay District found in the Town of Huntersville’s Zoning Ordinance. Access to Zoning Ordinances is usually available on the jurisdiction’s website under the “Planning Department.”
2. S.W.I.M. – Refer to the Applicability Section of the S.W.I.M. Stream Buffer Ordinance adopted for the jurisdiction where the parcel is located by using the following website: <http://stormwater.charmeck.org> (select “Regulations”, select “Surface Water Improvement & Management (SWIM)”, select jurisdiction where located). The S.W.I.M. Stream Buffer Ordinance for the jurisdiction is also available in the jurisdiction’s Zoning Ordinance located on their website under “Planning Department.”
3. Post-Construction Buffers – Refer to the Applicability Section of the Post-Construction Ordinance adopted by the jurisdiction where the parcel is located by using the following website: <http://stormwater.charmeck.org> (select “Regulations”, select “Post-Construction Storm Water Ordinances”, select jurisdiction where located).
4. Goose Creek and Six Mile Creek Buffers – For Goose Creek buffers, refer to Section 305(C)(2) of the Post-Construction Ordinance for the Town of Mint Hill using the directions provided in #3 above. For Six Mile Creek, refer to the Applicability Section of the Charlotte Post-Construction Storm Water Ordinance using the directions in #3 above. The specific language regarding the Six Mile Creek buffer is provided in Section 18-145(b)(4) of this ordinance.

A very important applicability provision that affects a large number of properties in Charlotte-Mecklenburg pertains to existing lots. For S.W.I.M. and post-construction buffers, if a lot is included in a recorded subdivision plan prior to the ordinance going into effect, then the buffer provisions do not apply regardless of whether the lot is developed or undeveloped. For S.W.I.M. buffers, redevelopment or expansion to existing structures on these exempt lots cannot result in an increase of impervious area in the buffer. No such provision is included in the post-construction ordinance. For water supply watershed buffers, developed lots are exempt from the buffer rules; however, undeveloped lots are subject to the buffer requirements and redevelopment or expansion of an existing structure on a developed lot cannot occur in the buffer. This is not the case in the Town of Cornelius where no trees larger than 2 inches in caliper can be removed from a lot existing in the water supply watershed as of the effective date of the ordinance regardless of whether the lot is developed or undeveloped, unless the tree is



diseased. The Town of Cornelius allows the removal of trees less than 2 inches in caliper in the watershed buffer provided they are replaced with an acceptable ground cover that stabilizes and filters. For Goose Creek, an existing use is allowed to be maintained on a vacant lot but if the lot is developed the buffer requirements will apply. For all buffer types, structures that existed prior to the effective date of the ordinance are exempt from ordinance requirements.

Another important determination to be made in assessing the applicability of buffer requirements is whether a vested right exists in which case buffer requirements would not apply. There are generally two (2) categories of vested rights: 1) statutory vested rights and 2) common law vested rights. Statutory vested rights exist because North Carolina statutes grant the power to determine vested rights to local governments as part of their overall zoning authority. See N.C. General Statute §153A-344.1 and 160A-385 for specific language. Under the statutory vested rights, the general criteria are as follows: 1) A site specific development plan; 2) Reviewed after proper notice at a quasi-judicial public hearing; and 3) Approved by the local government. The ordinances for each of the buffer types as described above contain more specific language regarding vesting. Common law vested rights exist because the courts have reviewed the facts of various cases and developed criteria for the “fairness” test when the government seeks to impose new rule requirements on an entity. The four (4) basic criteria (all of which must be met to make a determination on vested rights applicability) are: 1) substantial expenditures; 2) made in good faith; 3) in reliance on a governmental permit and 4) a detriment resulting from changing the project to comply with the new rules. All four of the criteria must be met because they build upon one another. The common law vested right applies to all land development activity and may not be specifically spelled out in the applicable ordinance.

A confusing factor with the applicability of buffer ordinances is that in many cases multiple buffer types apply to the same stream section as illustrated in Figure 2. In all such situations, the buffer that is the most protective of water quality will always govern. Typically, the more protective buffer is the wider buffer; however, the allowed uses within the buffer must also be considered. For example, a S.W.I.M. buffer and water supply watershed buffer for a parcel may both be 100 feet in width; however, the water supply watershed buffer is required to be left undisturbed whereas some disturbance is allowed in the S.W.I.M. buffer. Therefore, the watershed buffer would apply because it would be considered more protective of water quality.

In the City of Charlotte and its ETJ, all lots exempt from the post-construction ordinance are to be instructed to comply with the following buffer provisions:

- 1) Maintain a 10-foot undisturbed, vegetated buffer measured from the top of bank on both sides of the stream.
- 2) Streams to be piped must get approval (or provide notification in an NOI) from the Corps of Engineers and the State for the disturbance. Mitigation techniques approved as part of the Charlotte-Mecklenburg Buffer Implementation Guidelines are required for these piped streams.

2.1.2 Stream and Lake Shoreline Delineation

The stream and lake shoreline must be properly delineated to confirm whether a buffer requirement applies to a parcel. The delineation methods vary based on the type of buffer and



jurisdiction as summarized in Table 1 below.

Table 1: Stream and Lake Shoreline Delineation

Buffer Type	Jurisdictions	Stream and/or Lake Shoreline Buffer Delineation	Delineation Method
Post-Construction	Cornelius, Huntersville, Mint Hill (except Goose Creek), Pineville, and Meck. Co.	Perennial and intermittent streams	Mecklenburg County GIS (POLARIS)
Post-Construction	Davidson, Matthews, and Charlotte	Perennial and intermittent streams	Certified professional using approved State methodology
Goose Creek	Mint Hill	Perennial and intermittent streams	USGS & USDA Maps
Six Mile Creek	City of Charlotte	Perennial and intermittent streams	Certified professional using approved State methodology
S.W.I.M	Mecklenburg County, Charlotte, Pineville	Streams draining ≥ 100 acres	Mecklenburg County GIS (POLARIS)
S.W.I.M	Cornelius, Huntersville, Matthews, Mint Hill and Davidson	Streams draining ≥ 50 acres	Mecklenburg County GIS (POLARIS)
Water Supply Watershed	Charlotte, Davidson, Cornelius, and Huntersville	Perennial streams and lake shoreline	USGS Maps

Post-Construction Buffers (including Goose and Six Mile): Post-construction ordinances specify that buffers apply to perennial and intermittent streams as described below. Buffers do not apply to ephemeral streams.

- **Perennial:** A well-defined channel that contains water year round during a year of normal rainfall with the aquatic bed located below the water table for most of the year. Groundwater is the primary source of water for a perennial stream, but it also carries storm water. A perennial stream exhibits the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water (15A NCAC 02B .0233(2)(i)).
- **Intermittent:** A well-defined channel that contains water for only part of the year, typically during the winter and spring when the aquatic bed is below the water table. The flow may be heavily supplemented by storm water runoff. An intermittent stream often lacks the biological and hydrological characteristics commonly associated with the conveyance of water (15A NCAC 02B .0233(2)(g)).
- **Ephemeral:** A feature that carries only storm water in direct response to precipitation with water flowing only during and shortly after large precipitation events. An ephemeral stream may or may not have a well-defined channel, the aquatic bed is always above the water table, and storm water runoff is the primary source of water. An ephemeral stream typically lacks the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water (15A NCAC 02B .0233(2)(d)).

The post-construction ordinances for Cornelius, Huntersville, Mint Hill (except Goose Creek), Pineville, and Mecklenburg County specify that Mecklenburg County GIS will delineate the perennial and intermittent streams that require buffers using the most current digital elevation model of no greater than 10-foot cells. The ordinances further specify that this GIS coverage will be periodically updated as new data becomes available. As previously described, POLARIS



is the tool used by Mecklenburg County GIS to communicate this information to the public through the overlay entitled “Post Construction Buffers.” POLARIS also indicates the post-construction buffers for Davidson, Matthews, and Charlotte as well as Goose Creek in Mint Hill; however, the ordinances for these jurisdictions specifically state that the perennial and intermittent streams that require buffers must be delineated by a certified professional using U.S. Army Corps of Engineers and N.C. Division of Water Quality methodology. Charlotte-Mecklenburg Storm Water Services has determined that these delineations will be performed using the most recent version of the N.C. Stream Identification Methodology developed by the N.C. Division of Water Quality. For new developments, a certified professional must use Appendix 8 to document these delineations in Davidson, Matthews, Charlotte and Goose Creek and cannot rely on POLARIS for final delineation as in the other jurisdictions. Staff with Charlotte-Mecklenburg Storm Water Services and the N.C. Division of Water Quality are considered certified professionals if they have satisfactorily completed the latest version of the “Surface Water Identification Training and Certification” or SWITC. However, SWITC is not available to the private sector. Therefore, at the discretion of Charlotte-Mecklenburg Storm Water Services, the private sector may be considered certified if they have satisfactorily completed the “Intermittent and Perennial Stream Identification” class offered by N.C. State University (contact Kelly McCarter at 919-515-9563). Staff may also consider other training and experience toward meeting private sector certification requirements as deemed appropriate. The Program Manager shall make the final determination regarding all certifications and a list of certified professional will be maintained along with their qualifications. An exception to this rule has been made for the buffers in Goose Creek. The N.C. Division of Water Quality has field delineated all the intermittent and perennial streams in the Mecklenburg County portion of Goose Creek using the N.C. Stream Identification Methodology. In December 2012, this data was made available to Charlotte-Mecklenburg Storm Water Services and is accessible through Cityworks as a GIS layer. It is important to note that a delineation made by the N.C. Division of Water Quality will always have precedent over a delineation made by Charlotte-Mecklenburg Storm Water Services. Therefore, whenever a stream delineation is required for a Goose Creek buffer the data provided by the N.C. Division of Water Quality located in Cityworks will be used and Charlotte-Mecklenburg Storm Water Services will not perform a separate delineation. If staff has questions or concerns regarding this data, they are to consult with the Program Manager.

S.W.I.M. Buffers: S.W.I.M. buffer ordinances specify that buffers apply at the point that a stream drains greater than or equal to 50 or 100 acres depending on the jurisdiction as specified in Table 1 above regardless of whether the stream is perennial or intermittent. The ordinances further specify that Mecklenburg County GIS will delineate these streams. This data is included in POLARIS under the layer entitled “Water Quality Buffers (SWIM).”

Water Supply Watershed Buffers: Water supply watershed ordinances specify that buffers apply to the perennial streams as defined above that drain to the Catawba River lakes identified by a solid blue line on the USGS quadrangle maps. Mecklenburg County has digitally incorporated these maps into its POLARIS coverage as part of the layer entitled “Water Quality Buffers (SWIM).” The ordinances also specify that buffers apply to the lake shoreline, which must be delineation by a registered land surveyor based on the full pond elevation of the lake set by Duke Power as follows:

1. Lake Norman = 760 feet
2. Mountain Island lake = 647.5 feet
3. Lake Wylie = 569.4 feet

For buffers that apply to intermittent and/or perennial streams, which includes the post-construction and water supply watershed buffers, a property owner or designee can request a stream evaluation for possible exclusion from the buffer requirements using the process described below. For commercial developments and subdivisions, the same process applies except the owner or designee is required to submit a Stream Reach Evaluation Form (see Appendix 8) prepared by a certified professional for review by the Mecklenburg County Water Quality Program along with the “Application for Stream Exemption” described in step 1 below.

1. The owner or designee must submit an “Application for Stream Exemption” in the form of a letter to the Mecklenburg County Water Quality Program with Charlotte-Mecklenburg Storm Water Services at 700 North Tryon Street Charlotte, N.C. 28202. A map must also be enclosed with the letter showing the location of the stream reach being requested for evaluation.
2. Upon receipt of this letter with enclosures, the Mecklenburg County Water Quality Program will assign staff to evaluate the stream reach and complete the Stream Reach Evaluation Form provided in Appendix 8.
3. Upon completion of the evaluation, staff will compare their completed Stream Reach Evaluation Form to the requirements of the applicable ordinance and determine if a buffer applies. Staff will describe their findings in an Activity Report and attach the completed Stream Reach Evaluation Form as well as the appropriate notification letter to the applicant contained in Appendices 9 and 10. Staff will also attach an aerial photo of the stream reach from POLARIS. Staff will forward this Activity Report to their Supervisor for review and approval.
4. Upon approval or disapproval, the Supervisor will forward the signed letter and attached documents to the Water Quality Administrative Assistant for mailing.
5. If the stream buffer is not properly delineated in POLARIS, the Supervisor will inform the Watershed Manager and the POLARIS coverage will be updated as necessary to be consistent with staff findings.
6. Appeal of a decision regarding stream reach exclusion from buffer requirements is through the Storm Water Advisory Committee (see Section 7).

For S.W.I.M. Buffers that are required based on the size of the upstream drainage area, a property owner or designee can request a stream evaluation for possible exclusion from the buffer requirements using the following process.

1. The owner or designee must submit an “Application for Stream Buffer Change in POLARIS” in the form of a letter to the Mecklenburg County Water Quality Program with Charlotte-Mecklenburg Storm Water Services at 700 North Tryon Street Charlotte, N.C. 28202. A topographic map must be enclosed with this letter identifying the stream reach in question and corresponding upstream drainage area. Calculations must be provided with this map showing the methodology for delineating the drainage area size.
2. Upon receipt of this letter with enclosures, the Mecklenburg County Water Quality Program will assign staff to evaluate the information provided and confirm the size of the upstream drainage area for the stream section in question.

3. Upon completion of the evaluation, staff will compare their findings to the requirements of the applicable ordinance and determine if a buffer applies. Staff will describe their findings in an Activity Report and forward to their Supervisor for review and approval.
4. Upon approval or disapproval, the Supervisor will inform staff to notify the property owner or designee of the determination. This notification can be in the form of an email or letter.
5. The Supervisor will inform the Watershed Manager of any required changes in POLARIS.
6. Appeal of a decision regarding stream reach exclusion from buffer requirements is through the Storm Water Advisory Committee (see Section 7).

In POLARIS, stream delineations are digitally derived from topography generated from aerial surveys and most of the stream sections have not been field verified; therefore, errors sometimes occur in these delineations. The USGS maps used to delineate the water supply watershed buffers can also contain errors. In some situations, a stream may be shown on a parcel with a corresponding buffer where in actuality no stream exists. This can occur when a stream is piped underground or when an error occurs in POLARIS or the USGS mapping process. In such situations, the property owner or designee can contact the Mecklenburg County Water Quality Program with Charlotte-Mecklenburg Storm Water Services for assistance. If field verification is required, the process described above will be followed. In some situations the Program Manager or Supervisor may elect to perform the evaluation without receiving a written request from the owner or designee (#1 above). In some situations, it may be determined through a field evaluation that a stream exists on a parcel that is subject to buffer requirements but is not shown in POLARIS or on USGS maps. In such situations, the buffer requirement will apply and POLARIS will be updated to include the buffered section of stream.

In addition to the processes outlined above, a property owner or designee may contact the Mecklenburg County Water Quality Program with Charlotte-Mecklenburg Storm Water Services at 704-336-5456 to request assistance with a stream delineation for a buffer requirement. In some circumstances, Charlotte-Mecklenburg Storm Water Services may elect to delineate a stream or confirm the size of an upstream drainage basin in POLARIS without receiving a request from a property owner or other concerned party.

For all buffer types and in all jurisdictions in Mecklenburg County, water quality buffers do not apply to the following:

- Ditches and manmade conveyances other than modified natural streams.
- Manmade ponds and lakes that are not intersected by a buffered stream segment and that are located outside natural drainage ways.
- Ephemeral conveyances, which contain water only when it rains.
- Piped stream sections.

2.1.3 Buffer Area Delineation

Following a review of all applicable ordinances and the delineation of the stream or lake shoreline, the next step in determining whether a buffer applies to a parcel of land is the delineation of the buffer area on the ground. If this buffer area does not cross the parcel of land,

then the buffer does not apply. In some situations, only the buffer and not the stream may be located on a parcel of land in which case the buffer will apply. Structures existing at the time the buffer ordinance was adopted are exempt from buffer requirements and may remain in place. Expansions and/or redevelopment that impact the buffer may be prohibited, therefore it is essential to know the extent of the buffer on the ground to determine if it will be impacted.

All water quality buffers are measured horizontally on a line perpendicular to the surface water. For lakes, this measurement is made landward from the full pond elevation described in the previous subsection. For streams and the ponds that they intersect, buffers are measured landward from the top of the bank on both sides of the stream as illustrated by Figure 3. The bank of a stream or pond is the vertical or sloped area rising from the channel where normal or base flow occurs. The top of the bank is considered the most landward location of the bank of the stream or pond, which is typically where rooted herbaceous vegetation begins to become established. The stream bank provides the lateral constraints for all stages of flow except for the flood stage when flows spill over into the floodplain. Typically there is a topographic break between the steep stream bank and the flatter floodplain. This break usually characterizes the top of the bank from where buffer widths are measured. The slope and configuration of the stream bank can vary significantly depending on flow, soil type and topography. In urban streams that are highly eroded, the stream bank may rise almost vertically from the stream channel. In more rural settings, the bank may rise much more gently. According to all buffer rules, the delineation of the buffer on the ground must be performed by a registered land surveyor. POLARIS or any other GIS coverage as well as USGS quadrangle maps cannot be used to establish a buffer width since it is impossible to account for slope. In addition, the buffers shown in POLARIS as illustrated in Figure 2 are not to scale and cannot be used to determine the exact location of a buffer on the ground surface.



Figure 3: Buffer Area Measurement

2.1.4 Buffers Crossing Jurisdictional Boundaries

When buffers extend beyond jurisdictional boundaries, the buffer widths that apply to the jurisdiction where the parcel and not the stream are located will always apply. This is illustrated in Figure 4 where parcel # 22764137 is located in the Town of Matthews but the buffered stream is located in the City of Charlotte. In the City of Charlotte, the buffer width is 100 feet plus 50% of the area of the FEMA floodfringe (shown in Figure 4 as the green hatched area) beyond 100 feet. In the Town of Matthews, the buffer width is 100 feet plus 100% of the area of the FEMA floodfringe. Parcel # 22764137 is located approximately 160 feet from the stream, which is beyond 50% of the area of the floodfringe; however, a majority of the parcel is located within the floodfringe beyond 50% of the area. In this situation, Matthews’ buffer rules would apply since the parcel is located in Matthews; therefore, the portion of the parcel in the floodfringe is subject to the buffer rules.

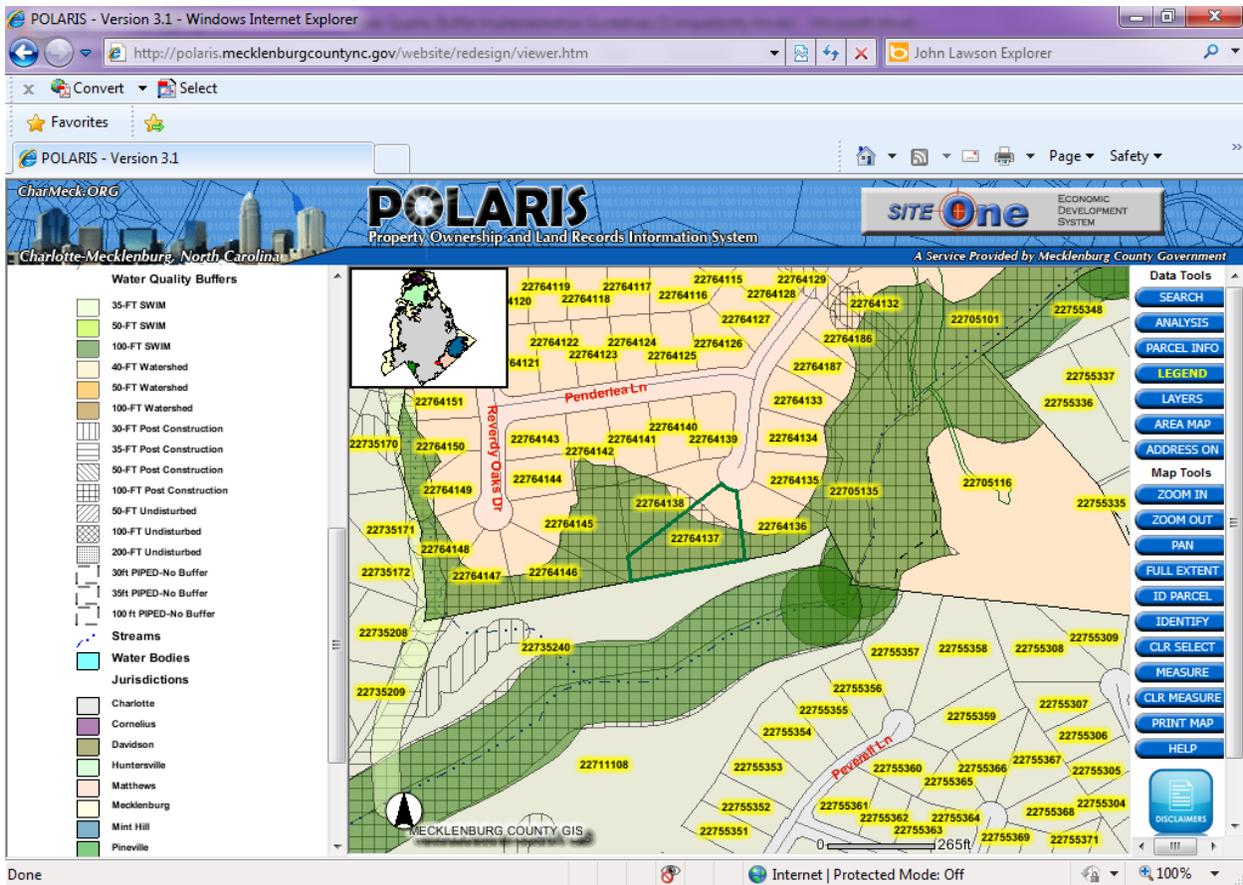


Figure 4: Buffer Crossing Jurisdictional Boundaries

2.2 Piped Stream Sections

Water quality buffer requirements do not apply to stream sections that were piped prior to the applicable buffer ordinance(s) going into effect. If at any time the pipe is removed and the stream channel is exposed to the surface, then the stream becomes subject to buffer requirements. Prior approval and mitigation is required for the piping of any stream section after the applicable

buffer ordinance has gone into effect provided the ordinance allows for this type of buffer disturbance as described in Sections 4 and 5 of this document. State and/or federal mitigation does not satisfy the local mitigation requirement. However, mitigation activities approved by a State or federal agency (acting pursuant to Sections 401 or 404 of the federal Clean Water Act) are exempt from the buffer requirements provided disturbed areas are properly stabilized and seeded within seven (7) days of project completion.

2.3 Existing Impervious Cover

For all buffer types, structures and other impervious cover such as parking lots, etc. as well as uses such as lawns, agriculture etc. that were present within the stream or lake buffer as of the effective date of the applicable ordinance and have continued to exist since that time are exempt from ordinance requirements. For S.W.I.M. and post-construction buffers, the redevelopment or expansion of such structures and other impervious cover is also exempt from buffer requirements provided it does not result in an increase in the total impervious area within the buffer. For water supply watershed buffers, any redevelopment or rebuilding activity involving an existing structure that requires a building permit is not allowed. For buffers in Goose and Six Mile Creeks, the redevelopment of an existing structure is exempt from buffer requirements provided the following conditions are met:

- The redevelopment occurs on the same footprint as the existing development.
- Existing storm water controls remain, including diffuse flow conditions.
- The redevelopment of nonresidential structures results in the disturbance of less than a half acre.
- The site remains vegetated in a manner similar to existing conditions.
- Applicable storm water control requirements are met.

Section 3 Land Development Requirements

3.1 Construction Plans and Record Plats

All construction plans and record plats must adequately delineate the required water quality buffer areas. This delineation must be performed by a registered land surveyor. Plans may be prepared and sealed by a licensed professional engineer as long as the top of the bank or full pond elevation are labeled as “field located.” The following requirements apply to all water quality buffers and must be adequately addressed on plans. Items 5, 8 and 9 below must be included as notations on plans. Appendix 11 provides a plan review check sheet for water quality buffer requirements.

1. The water quality buffer must be measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on both sides of the stream or pond they intersect. For Catawba River lakes, this measurement is made from the full pond elevation.
2. All water quality buffers must be clearly marked and labeled on plans as “WATER QUALITY BUFFER.” Plans must also label the outside boundary of the buffer and each of the buffer zones as well as the top of the bank or full pond elevation from where the buffer was measured.
3. Temporary sediment basins and other erosion control measures are not allowed in the buffer. The locations of all sediment and erosion control devices must be clearly indicated on plans.
4. No disturbance is to occur in the entire buffer if indicated as an “Undisturbed” buffer, which includes the water supply watershed, post-construction Yadkin districts for Davidson and Matthews, Goose Creek and Six Mile Creek buffers. Other water quality buffers, including post-construction and S.W.I.M., have different zones that determine the amount of disturbance allowed. The stream side zone of the buffer must be left completely undisturbed. In the managed use zone, a limited number of trees can be removed provided that the tree density remaining is a minimum of 8 healthy trees of a minimum 6-inch caliper per 1000 square feet. These trees should be evenly distributed throughout the managed use zone. Removal of existing vegetation must be performed by hand in such a manner as to prevent damage to the roots of remaining trees. No heavy equipment is permitted in the managed use or stream side zones except for the approved installation of utilities. No fill material can be brought into any of the buffer zones. No grubbing is allowed in the managed use or stream side zones.
5. Grading and other land disturbing activities are allowed only in the upland zone of S.W.I.M. and post-construction buffers; however, these activities must be performed in such a manner as to prevent damage to the roots of remaining trees. Grass and/or other suitable ground cover can be planted in the upland zone.
6. No structures can be placed in the water quality buffer except non-commercial buildings for storage, which can be placed in the upland zone of post-construction and S.W.I.M. buffers provided they do not exceed 150 square feet.
7. All storm water outfalls must be clearly indicated on plans and shown ending prior to the water quality buffer. Engineered or improved channels and piped storm water are not

- allowed in or through the buffer. Invert elevations at pipe outlets must be field verified and adjusted if needed to be zero to one foot higher than the buffer boundary.
8. Drainage outfalls must be designed to allow water to sheet flow across the buffer to filter out pollutants. Diffuse flow of runoff must be maintained in the buffer by dispersing concentrated flow and re-establishing any disturbed vegetation. Concentrated runoff from ditches or other manmade conveyances will be converted to diffuse flow before the runoff enters the buffer. Periodic corrective action to restore diffuse flow, including maintaining/enhancing vegetative cover, must be implemented as necessary to prevent the formation of erosion gullies. Plantings downstream of the flow diffusion device must be adequate to prevent erosion. Devices for providing diffuse flow are specified in the Charlotte-Mecklenburg Land Development Standards Manual. All such devices must be located outside the buffer area.
 9. The outside buffer boundary must be clearly marked by orange fabric fencing prior to any land disturbing activities at the site and this fencing must be called out on the plans. In situations where the disturbed limits of a development occur prior to the water quality buffer, the orange fabric fencing may be installed at the edge of the disturbed area and prior to the outside edge of the buffer.
 10. Any activity in the buffer must comply with the applicable Ordinance as well as these Guidelines.
 11. Water quality buffer boundaries, including the delineation of each zone (if applicable), must be shown on all surveys and record plats, including individual record plats for any lots affected.

3.2 Informing Builders and Property Owners of Buffer Requirements

The land developer must distribute educational materials concerning the buffer to each builder prior to building construction who will in-turn inform each homeowner prior to building occupancy. The builder is also responsible for notifying all contractors of the buffer regulations prior to development. A buffer brochure is available for use at the following website: <http://stormwater.charmeck.org> (select “Regulations” on left side of screen, select “Buffers & BMPs”, select “buffers” from the text, select “Water Quality Buffer mailer” at the bottom). The water quality buffer must be clearly marked on all record plats and labeled as “Area Not To Be Disturbed.”

Buffer requirements must be referenced in homeowners’ association documents. The suggested language for these documents is as follows:

“This development contains water quality buffers that filter pollutants from storm water runoff before it enters the creek or lake thus improving overall water quality conditions. BE SURE to check the record plat for your property. Water quality buffers will be clearly marked. If you have a water quality buffer on your property, it should remain undisturbed except for maintaining existing lawns. A disturbance of a water quality buffer violates State and local laws and could subject you to a fine. For questions or to report suspected water quality buffer violations, please call 311.”

Section 4 Water Quality Buffer Disturbances

4.1 Categories of Buffer Disturbances

All buffer disturbances fall into one of three (3) categories as follows:

1. Exempt (buffer rules do not apply) – Buffer disturbances designated as exempt are allowed within the buffer. Exempt disturbances must be designed, constructed and maintained to minimize soil disturbance and to provide the maximum water quality protection practicable.
2. Potentially Allowable (requires an “Authorization Certificate”) – Buffer disturbances designated as potentially allowable may proceed provided it is demonstrated by the applicant that there are no practical alternatives to the requested use as described in Section 5.3. These disturbances require an Authorization Certificate from Charlotte-Mecklenburg Storm Water Services or in the case of some jurisdictions the authorization must come from the local Zoning Board of Adjustment. Most of these disturbances will require mitigation as discussed in Section 5.4. The purpose of this mitigation is to offset the effect of a buffer disturbance so there is minimal negative impact to surface water quality or aquatic life.
3. Prohibited (not allowed unless a variance is granted) – Disturbances designated as prohibited may not proceed within the buffer unless a variance is granted as described in Section 7. Site-specific mitigation may be required as a condition of variance approval.

The types of disturbances that fall into the three (3) categories differ depending on the type of buffer that applies and the jurisdiction where the buffer is located as described in the following Sections.

4.2 Water Supply Watershed Buffer Disturbances

Water supply watershed buffers were the first buffers established for the protection of water quality in Charlotte-Mecklenburg. The purpose of these buffers is to protect water quality conditions in the drinking water supply reservoirs in the Catawba River, including Lake Norman, Mountain Island Lake and Lake Wylie. These buffers do not have multiple zones with varying levels of allowable disturbances as do the more recently adopted buffer rules and generally water supply watershed buffers are considered to be “undisturbed” although some minimal disturbance is allowed.

4.2.1 Exempt Disturbances in Water Supply Watershed Buffers

Provided below are the disturbances that are considered to be exempt from the water supply watershed buffer requirements. These activities can be performed without prior authorization and do not require mitigation for the buffer impact. All disturbed land surfaces in the buffer must be stabilized using an effective groundcover.

1. Public projects such as roads and bridges.
2. The limbing of trees up to half the distance of their height.
3. The removal of dead trees.

4. Minimal hand clearing of small undergrowth and removal of trees two (2) inches in caliper or smaller measured six (6) inches above the root ball.
5. The addition of new trees and/or shrubs.

4.2.2 Potentially Allowable Disturbances in Water Supply Watershed Buffers

The following disturbances are potentially allowable requiring prior approval in the form of an “Authorization Certificate” from Charlotte-Mecklenburg Storm Water Services as well as possible mitigation. The process to follow to obtain this approval is described in Section 5. If any of these activities result in the removal of existing trees greater than 2-inch caliper measured six (6) inches above the root ball, then Level 2 revegetation authorized by Charlotte-Mecklenburg Storm Water Services is required as described in Section 6.1.2. All disturbed land surfaces both inside and outside the water quality buffer must be stabilized using an effective groundcover.

1. Removal of damaged or diseased trees larger than two (2) inch caliper measured six (6) inches above the root ball that could potentially fall and damage a structure.
2. Removal of invasive species (see Appendix 35).
3. Stream bank or shoreline stabilization and dredging approved by Duke Energy.
4. Pathways that adhere to the Pathway Guidelines (see Appendix 12).
5. Irrigation systems that adhere to the Irrigation System Guidelines (Appendix 13).
6. Installation of piers approved by Duke Energy provided no trees greater than two (2) inch caliper measured six (6) inches above the root ball are removed or damaged, slatted decking is used to allow rainwater to pass through, and no roofed structures are placed within the buffer.
7. Installation of fences provided no trees greater than two (2) inch caliper measured six (6) inches above the root ball are removed or damaged and the fence is constructed with chain link, split rail, aluminum picket, or wood slat. No brick or concrete walls are allowed.

On occasion, staff receive requests for minor buffer disturbances such as the installation of flag poles, signs, security lights and other new structures that result in a very minimal increase in impervious cover. In such cases, approval can be granted by a supervisor or the program manager on a case-by-case basis outside the normal review process described in Section 5. For such situations, approval can be granted by email without the submittal of an application or approval of mitigation.

4.2.3 Prohibited Disturbances in Water Supply Watershed Buffers

The following disturbances are prohibited in the water supply watershed buffer.

1. Installation of permanent structures and/or built upon areas, including but not limited to septic tank systems, sidewalks, patios, gazebos, brick or concrete walls and out buildings. Pervious asphalt, concrete, any type of gravel and pavers are also considered “built-upon area” and cannot be placed in the buffer.
2. Grading, clearing or filling in the buffer.
3. Installation of ponds or structural Best Management Practices (BMPs).

4. Piping of roof drains or other drainage through the buffer. All storm water pipes must stop prior to the buffer and discharge as sheet flow.
5. Planting turf grass.
6. Installation of impervious pathways.

Any variation from the above requires a variance from the Zoning Board of Adjustment for the jurisdiction where the disturbance is proposed (see Section 7). A buffer disturbance in violation of the above criteria and in the absence of a variance is considered illegal and will require restoration (see Section 5.4.5). The exception is with the buffer rules for Lower Lake Wylie in the City of Charlotte, which includes provisions for preapproval by staff of buffer impacts in the event of a legitimate “hardship” and following approval of a mitigation plan. Three (3) mitigation techniques are allowed, including Buffer Restoration, Buffer Preservation and Mitigation Credits (see Section 5.4.2).

4.3 S.W.I.M. and Post-Construction Buffer Disturbances

The Surface Water Improvement and Management (S.W.I.M.) buffer ordinances allow a variety of disturbances and are generally less restrictive than the water supply watershed buffer rules described in the previous section. In addition, the S.W.I.M. buffers have three (3) zones, including the stream side, managed use and upland zones. The allowable disturbances within the buffer vary depending on the zone (see Appendix 3). The post-construction buffer requirements for all the jurisdictions in Charlotte-Mecklenburg specify that the uses allowed in the different S.W.I.M. buffer zones, as well as the other provisions of the S.W.I.M. ordinances, apply to post-construction buffers. There are a few very important distinctions regarding the post-construction buffers as follows:

1. If a S.W.I.M. buffer zone, including stream side, managed use and upland, is not indicated for a buffer width in the post-construction ordinance language, then the uses specified for these zones in the S.W.I.M. buffer ordinance do not apply and disturbance of this buffer is not allowed unless specifically stated in the post-construction ordinance. For example, in many of the jurisdictions the post-construction ordinance requires a 30-foot vegetated buffer with a 10-foot zone adjacent to the bank for streams draining less than 50 acres. This 10-foot zone is not referred to as a stream side, managed use or upland zone; therefore, the uses allowed in S.W.I.M. buffer ordinances for these zones do not apply to this 30-foot buffer, including the installation of BMPs, outbuildings, etc. The post-construction ordinance specifically states that disturbance of the 30-foot buffer is allowed and that revegetation is required; however, no built-upon area can be added to this buffer. 15A NCAC 02H .1017(c) grants an exception allowing built-upon area within this 30-foot Post-Construction buffer when there is a lack of practical alternatives. To qualify for this exception, prior approval must be obtained from the appropriate agency through the submittal of an Authorization Certification Application as described in Section 5. Section 2 of this application includes a “Request for a No Practical Alternatives Designation” that must be approved in order for an exception to be granted. Buffer mitigation may be required for the addition of built-upon area within the 30-foot Post-Construction buffer. At a minimum, Level 1 revegetation is required as described in Section 6 except for disturbances within 10 feet of the top of the bank, which requires stream bank stabilization using bioengineering techniques.

2. Goose and Six Mile Creeks have separate and more restrictive requirements than the S.W.I.M. buffers as described in Section 4.4 and Appendix 6. S.W.I.M. buffer zones and the uses allowed in these zones do not apply to these buffers. The reason for these restrictions is that these creeks are home to a federally endangered species of freshwater mussel called the Carolina heelsplitter, which requires a well established buffer with minimal disturbances for its survival.

4.3.1 Exempt Disturbances

Provided below are the disturbances that are considered to be exempt from the S.W.I.M. and post-construction buffer requirements. Prior approval and mitigation for these disturbances is not required. The specific wording for the exemption varies slightly for the Towns and to ensure compliance refer to the language in the applicable ordinance. For all exempt disturbances, the streamside zone of the buffer shall be maintained to the maximum extent practicable. In addition, all disturbed areas must be stabilized and seeded within seven (7) days following project completion. Grasses and other herbaceous groundcovers are allowed. The natural contour of the land should be maintained.

1. Above ground utility crossings. It is recommended that woody vegetation be cleared by hand and that tree stumps remain. Land grubbing and grading is discouraged. Maintaining the vegetative root systems helps to preserve the integrity of the soil and minimize soil erosion. Construction activities should minimize the removal of woody vegetation, as well as the extent of the disturbed area and the amount of time the areas remain in a disturbed state. Measures should be undertaken after construction and during routine maintenance to ensure diffuse flow of storm water through the buffer.
2. Below ground utility crossings. For all projects constructed for Charlotte-Mecklenburg Utilities' (CMU), stabilization and seeding should be performed in accordance with the CMU Design Manual.
3. Domesticated animal trails (farming). Stream crossings must be constructed and maintained to minimize impacts to the stream side zone with fencing perpendicular and through the buffer to direct animal movement.
4. Drainage improvements/repairs for maintenance. Includes projects performed by Charlotte-Mecklenburg Storm Water Services.
5. Fences. Minimal disturbance of existing vegetation is allowed.
6. Flood control structures.
7. Land clearing. No cutting or clearing is allowed in the stream side zone except for the approved disturbances described in this Section. In the managed use zone, existing trees can be removed provided a density is maintained of 8 healthy trees of a minimum 6 inch caliper per 1000 square feet. In the upland zone, clearing and grading is allowed.
8. Mitigation activities. All mitigation activities are allowed in the buffer as approved by a State or Federal Agency acting pursuant to Sections 401 and/or 404 of the federal Clean Water Act.
9. Water and sewer utility installations. Installations should be near parallel to the stream.
10. Paths and trails. Pathways must use existing and proposed utility alignments or previously cleared areas and minimize tree cutting to the maximum extent practicable. Paths and trails cannot exceed 10 feet in width. To the extent possible, pathways should preserve existing drainage patterns and avoid drainage structures that concentrate storm

water flow. Paths and trails made of materials considered to be built-upon area (such as asphalt, concrete, gravel, etc.) are not exempt and must remain greater than 30 feet from the top-of-bank for all developments where the Post-Construction Ordinance applies unless prior approval is obtained from the appropriate agency through the submittal of an Authorization Certification Application as described in Section 5 (see #1 in Section 4.3 above). Buffer restoration may be required as mitigation for the addition of built-upon area within the 30-foot Post-Construction buffer except for disturbances within 10 feet of the top of the bank, which requires stream bank stabilization using bioengineering techniques. As an alternative to mitigation, BMPs that promote storm water infiltration of runoff from the path may be used and can include the use of vegetated filter strips, grass swales, permeable pavement, and/or infiltration devices. These BMPs will be required to be maintained by the owner to ensure they continue to function as designed.

11. Piped or culverted streams. Streams that were piped or culverted prior to the effective date of the applicable ordinance are exempt from the buffer requirements.
12. Road crossings and bridges. If site plan approval is granted by the Planning Department, then road crossings and bridges for connectivity or transportation links (not including driveways) are exempt from the buffer requirements.
13. Storm water best management practices (BMPs). BMPs are allowed in the upland and managed use zones but not in the stream side zone. The discharge and all energy dissipation devices associated with the BMP must end prior to the stream side zone.
14. Stream bank stabilization.
15. Vegetation management. The following is allowed in the S.W.I.M. buffer for the management of vegetation:
 - Emergency fire control measures provided that topography is restored.
 - Planting vegetation to enhance the riparian buffer.
 - Pruning forest vegetation provided that the health and function of the forest vegetation is not compromised.
 - Removal of individual trees which are in danger of causing damage to dwellings, other structures or human life.
 - Removal of poison ivy.
 - Removal of understory nuisance vegetation as defined in: Smith, Cherri L. 1998. Exotic Plant Guidelines. Department of Environment and Natural Resources. Division of Parks and Recreation. Raleigh, NC. Guideline #30 (see Appendix 35).

4.3.2 Potentially Allowable Disturbances

In Mecklenburg County and the City of Charlotte as well as the Towns of Mint Hill and Pineville, any proposed disturbance of a S.W.I.M. or post-construction buffer that is not described in Section 4.3.1 above is considered potentially allowable and requires prior approval in the form of an “Authorization Certificate” (see Section 5) from Charlotte-Mecklenburg Storm Water Services, which includes mitigation. The same holds true for the Town of Cornelius except the Town’s Planning Director must be consulted prior to approval of an Authorization Certificate. There are no prohibited buffer disturbances in these jurisdictions. All disturbances are considered potentially allowable with prior approval. Section 5 includes additional

information regarding the approval process for buffer disturbances. Some of the potentially allowable buffer disturbances are listed below.

- filling or piping of streams;
- removal of vegetation from the stream side or managed use zones other than as described above;
- paths proposed within the stream side zone and the 30-foot Post-Construction buffer;
- stream relocations;
- fences and walls requiring tree removal in the stream side zone;
- filling in any of the 3 buffer zones;
- locating structures in any of the buffer zones; and
- extending a storm water outfall into the buffer.

4.3.3 Prohibited Disturbances

There are no prohibited S.W.I.M. or post-construction buffer disturbances in Mecklenburg County and the City of Charlotte as well as in the Towns of Mint Hill and Pineville. All disturbances in these jurisdictions are considered exempt or potentially allowed (see Sections 4.3.1 and 4.3.2). In the Towns of Cornelius, Davidson, Huntersville and Matthews, any variation from the exempt disturbances described in Section 4.3.1 are considered prohibited and a variance is required (see Section 7). These jurisdictions do not provide for potentially allowable buffer disturbances as described in Section 4.3.2. For S.W.I.M. buffer disturbances, the Town's Zoning Board of Adjustment would consider the variance. For Cornelius, their Zoning Board of Adjustment would also consider variances for post-construction buffer disturbances as stated in the variance section of their post-construction ordinance. For the Towns of Davidson, Huntersville and Matthews, a variance for a disturbance of the post-construction buffer would be considered by the Charlotte-Mecklenburg Storm Water Advisory Committee. For all jurisdictions, the issuance of a 401 or 404 Permit does not automatically authorize an impact to the S.W.I.M. buffer unless it is an exempt disturbance, such as a road crossing, etc. If not an exempt disturbance, local approval is required.

4.3.4 Greenway Trails

Greenway trails built by County or Town Park and Recreation Departments for public use are common along streams within Mecklenburg County. There are currently 37 miles of developed trails and 150 miles of planned trails in Mecklenburg County. The purpose of these trails is to provide the public with recreation, fitness, and education through exposure to wildlife habitat and natural buffers along streams. These trails are typically constructed of asphalt, concrete, or gravel and are located as far as practicable from the top of the stream bank maximizing the use of existing right-of-ways. On occasion, no practical alternative exists to locating these trails within the stream-side zone or 30-foot Post-Construction buffer.

15A NCAC 02H .1017(c) grants an exception allowing built-upon area, including greenway trails, within the 30-foot Post-Construction buffer when there is a lack of practical alternatives. To qualify for this exception, prior approval must be obtained from the appropriate agency through the submittal of an Authorization Certification Application as described in Section 5. Section 2 of this application includes a "Request for a No Practical Alternatives Designation"

that must be approved in order for an exception to be granted. Buffer restoration may be required as mitigation for the addition of built-upon area within the 30-foot Post-Construction buffer except for disturbances within 10 feet of the top of the bank, which requires stream bank stabilization using bioengineering techniques. As an alternative to mitigation, BMPs that promote storm water infiltration of runoff from the greenway trail may be used and can include the use of vegetated filter strips, grass swales, permeable pavement, and/or infiltration devices. These BMPs will be required to be maintained by Park and Recreation staff to ensure they continue to function as designed.

4.4 Goose Creek and Six Mile Creek Buffer Disturbances

The buffer requirements for Goose and Six Mile Creeks are more restrictive than the S.W.I.M. and post-construction buffers but less restrictive than the water supply watershed buffers. Also, like the water supply watershed buffers the buffers for Goose and Six Mile Creeks are considered “undisturbed” and do not include zones. The exempt, potentially allowable and prohibited disturbances for buffers along Goose and Six Mile Creeks are summarized in Appendix 6. In Goose Creek, the buffer requirements apply to all properties except those with an existing and ongoing use or redevelopment of an existing structure as of the effective date of the ordinance (March 11, 2010). These provisions are further defined in Section 4.4.1 below. In Six Mile Creek, the applicability criteria specified in Charlotte’s post-construction ordinance govern whether the buffer requirements apply. In other words, if the post-construction ordinance applies so do the buffer requirements and vice-versa. This is not the case in Goose Creek where buffers have separate applicability criteria from the rest of the post-construction ordinance. The process to be followed to obtain approval for a buffer disturbance in both Goose and Six Mile Creeks is described in Section 5. The mitigation options available for buffers on Goose and Six Mile Creeks are described in Section 5.4.4.

4.4.1 Existing Uses in Goose Creek

For Goose and Six Mile Creeks, existing and ongoing uses within the stream buffer and disturbances associated with the maintenance of these uses are exempt from the buffer requirements. Only the portion of the stream buffer that contains the footprint of the existing and ongoing use is exempt. A use is considered existing and ongoing if it was present within the stream buffer as of February 1, 2009 (effective date of the N.C. Site Specific Water Quality Management Plan for Goose Creek) and has continued since that time. A use may also be considered existing and ongoing if vested rights exist. Existing uses include agriculture, buildings, industrial facilities, commercial areas, transportation facilities, maintained lawns, utility lines, and on-site sanitary sewage systems. Existing uses continue through a change in ownership. Activities necessary to maintain uses are allowed provided the site remains similarly vegetated, no built-upon area is added within the stream buffer area where it did not exist as of February 1, 2009, and existing diffuse flow is maintained.

A use is also considered existing and ongoing and thereby exempt from buffer requirements if it can be documented to Charlotte-Mecklenburg Storm Water Services that at least one of the following criteria were met prior to February 1, 2009:

- Project requires a 401 Certification/404 Permit, and such permits are still valid;

- Project requires a State permit, such as a landfill, NPDES wastewater discharge, land application residuals and road construction activities, and has begun construction or is under contract to begin construction and has received all required State permits;
- Project is being reviewed through the Clean Water Act Section 404/National Environmental Policy Act Merger 01 Process or Safe Accountable Flexible Efficient Transportation Equity Act; a Legacy for Users (published by the US Army Corps of Engineers and Federal Highway Administration, 2003) or its immediate successor and that have reached agreement with Department of Environment and Natural Resources on avoidance and minimization; or
- Project is not required to be reviewed by the Clean Water Act Section 404/National Environmental Policy Act Merger 01 Process or Safe Accountable Flexible Efficient Transportation Equity Act; a Legacy for Users (published by the US Army Corps of Engineers and Federal Highway Administration, 2003) or its immediate successor if a Finding of No Significant Impact has been issued for the project and the project has the written approval of the Division of Water Quality.

At the time an existing use is changed to another use, the stream buffer requirements will apply. Change of use includes, but is not limited to, the following:

- The addition of built-upon area within the stream buffer;
- An agricultural operation within the stream buffer is converted to a non-agricultural use; or
- A lawn within the stream buffer that ceases to be maintained.

Redevelopment of a structure that was present within the stream buffer as of February 1, 2009 and has continued to exist since that time is considered an existing and ongoing use and is thereby exempt from buffer requirements in Goose and Six Mile Creeks provided the following applies:

- Redevelopment occurs on the same footprint as the existing development;
- Existing storm water controls remain, including diffuse flow conditions;
- Redevelopment of nonresidential structures results in the disturbance of less than a half acre;
- Site remains vegetated in a manner similar to existing conditions; and
- Applicable storm water control requirements are met.

The final determination of whether a use is existing and ongoing is made by Charlotte-Mecklenburg Storm Water Services. Appeals of such determinations are handled by the Charlotte-Mecklenburg Storm Water Advisory Committee.

Section 5 Obtaining Approval for Water Quality Buffer Disturbances

5.1 Authorization Certificate Application

Approval must be obtained for all “potentially allowable” buffer disturbances prior to the initiation of any activity (see Section 4). Approval for buffer disturbances considered as “prohibited” must be obtained through the variance process as described in Section 7. The agency responsible for issuing approvals for potentially allowable buffer disturbances depends on the buffer type and jurisdiction as summarized in Table 2.

Table 2: Agency Responsible for Approval of Potentially Allowable Buffer Disturbances

Jurisdiction	Type of Buffer Proposed for Disturbance				
	Water Supply Watershed	S.W.I.M.	Post-Construction	Goose Cr.	Six Mile Cr.
Charlotte	CMSWS (2)	CMSWS	CMSWS	N/A	CMSWS
Cornelius	CMSWS (3)	ZBA (4)	ZBA (4)	N/A	N/A
Davidson	CMSWS	ZBA (4)	SWAC (4)	N/A	N/A
Huntersville	CMSWS	ZBA (4)	ZBA (4)	N/A	N/A
Matthews	N/A	ZBA (4)	SWAC (4)	N/A	N/A
Mint Hill	N/A	CMSWS	CMSWS	CMSWS	N/A
Pineville	N/A	CMSWS	CMSWS	N/A	N/A
Mecklenburg County (1)	N/A	CMSWS	CMSWS	N/A	N/A

Acronyms: CMSWS = Charlotte-Mecklenburg Storm Water Services; ZBA = Zoning Board of Adjustment appointed by the jurisdiction; and N/A = Not Applicable

Footnotes: (1) Includes only the 1 square mile area south of Pineville where Mecklenburg County has zoning authority; (2) The Zoning Administrator for the City of Charlotte is consulted on all these buffer disturbances and usually a variance from the ZBA is required; (3) The Planning Director for the Town of Cornelius is consulted on all these buffer disturbances and usually a variance from the ZBA is not required; and (4) There are no potentially allowable buffer disturbances in these jurisdictions; therefore, all buffer disturbances require a variance from the applicable authority.

All buffer disturbances considered for approval by Charlotte-Mecklenburg Storm Water Services as indicated in Table 2 require that the property owner or their agent submit a properly completed “Authorization Certificate Application” form (see Appendix 14) prior to the initiation of any activities in the buffer. Completion of an Authorization Certificate Application form is also required for approval of mitigation/restoration for illegal buffer disturbances as described in Section 5.4.5. The Authorization Certificate is valid for 12 months following the approval date. The buffer disturbance and all mitigation measures must be completed and approved by Charlotte-Mecklenburg Storm Water Services prior to the end of 12 months or the Authorization Certificate is considered null and void and a new Authorization Certificate Application form will need to be submitted. Review and approval of Authorization Certificate Applications is performed by either City or County staff based on the following guidelines.

- **City Staff Reviews** (submit to Mike MacIntyre at Charlotte Storm Water Services, 600 East Fourth Street, Charlotte, N.C. 28202-2844, phone number 704-432-5570):
In the City of Charlotte and its ETJ, City staff will handle all reviews of Authorization Certificate Applications for projects that are handled by Charlotte Land Development which includes all subdivisions, multifamily and commercial developments. The basic

rule to follow is that if a project is required to comply with the City's post-construction ordinance, then the buffer review process will be handled by City staff.

- County Staff Reviews (submit to John McCulloch at the Mecklenburg County Water Quality Program, 700 N. Tryon Street, Charlotte, N.C. 28202, phone number 704-336-5455):

In the City of Charlotte and its ETJ, County staff will handle all reviews of Authorization Certificate Applications for projects that are not handled by Charlotte Land Development which includes (but is not limited to) single-family residential developments, redevelopments and expansions that are not tied to a subdivision plan review as well as all applications for water supply watershed buffer disturbances along the Catawba River lakes in the City and its ETJ. In addition, County staff will handle Authorization Certificate Applications in the Towns and their ETJ areas.

The Authorization Certification Application form for water quality buffer disturbances includes three (3) sections as follows: Section 1 - General Information, Section 2 - Finding of No Practical Alternatives, and Section 3 - Mitigation. These Sections of the application are described further in parts 5.2, 5.3 and 5.4 below. For mitigation/restoration in response to a buffer violation, Sections 1 and 3 of the application must be completed but not Section 2 since the buffer disturbance has already occurred illegally thus there is no need for a finding of no practical alternative. For potentially allowable buffer disturbances that do not require mitigation as described in Section 4, Sections 1 and 2 of the form must be completed and not Section 3. For potentially allowable buffer disturbances that do require mitigation, all three (3) sections of the form must be completed by the applicant. The mitigation section requires the submittal of attachments as described in Section 5.4. Additional information regarding the completion of this form is provided in the following Sections. The approval of an Authorization Certification for a buffer disturbance requires that the following two (2) conditions be satisfied:

1. No practical alternatives exist for the buffer disturbance.
2. The proposed mitigation is sufficient to offset the negative impacts to the quality and usability of downstream surface waters associated with the buffer disturbance.

5.2 Section 1 – General Information

The applicant is required to provide the following general information in Section 1 of the Authorization Certificate Application form:

1. Applicant name, mailing address, phone numbers (office and cell), and email address.
2. If different from applicant, property owner name, mailing address, phone numbers (office and cell), and email address. Also, indicate applicant's affiliation with the owner. Written authorization for the buffer disturbance signed by the property owner must be attached to the application for it to be considered for approval.
3. Information regarding all contractors involved in the proposed buffer disturbance and restoration activities, including name, mailing address, phone numbers (office and cell), and email address. There is space for only one (1) contractor on the form. If multiple contractors are involved, include on a separate sheet of paper all the information required in the form for these contractors. If no contractors are involved indicated N/A for Not Applicable.

4. Location information regarding the buffer disturbance, including jurisdiction, address, subdivision name, and lot number (if applicable) of proposed buffer disturbance.
5. Type of buffer, including water supply watershed, S.W.I.M., post-construction, Goose Creek, or Six Mile Creek. Only one buffer type can be selected. If multiple buffers apply to the parcel, the more restrictive buffer will be used (see Section 4).
6. Type of buffer disturbance, including removal of vegetation, installation of structure, addition of fill, grading/land disturbing, and other (specify). All the buffer disturbances that apply must be indicated on the form.
7. Nature of the activity to be conducted by the applicant that will result in the buffer disturbance, such as shoreline stabilization, installation of a boardwalk, etc.
8. Reason for the proposed buffer disturbance, such as to improve access to a pier or dock via a boardwalk.
9. Total square footage of the parcel and the square footage of the area to be disturbed by the activity, including all equipment staging areas, access areas, etc. located both inside and outside the buffer.
10. Total square footage of the buffer on the parcel, including the square footage in each zone. If the buffer does not include zones, then indicate the width under "Total."
11. Total square footage of the buffer to be disturbed by the activity and the square footage of disturbance in each zone, including the area of the footprint of the use within the buffer that is causing the impact to the buffer; the area of the boundary of any clearing and grading activities necessary to accommodate the use outside the footprint of the use; and the area of any ongoing maintenance corridors within the stream buffer associated with the use outside the footprint and clearing/grading limits of the use. Temporary equipment access areas are not included in the disturbed area calculation provided tree removal and grading are not required and the area is properly stabilized.
12. Proposed work schedule, including the date when the buffer disturbance will occur and the date when mitigation will be completed. The mitigation is not considered complete until all disturbed areas both inside and outside the buffer have been stabilized and all mitigation measures have been installed.
13. Attach a scaled map of the parcel where the buffer disturbance is proposed that includes the following information. **IMPORANT NOTE:** If mitigation is to be performed, use this as a base map for delineating all mitigation techniques as described in Section 5.4. An example of a map including buffer disturbance and mitigation is provided in Appendix 16.
 - a. Lengths of all boundary/property lines and the parcel's address where the activity and buffer disturbance are proposed.
 - b. Location of all water course(s) on the property, including all perennial and intermittent streams, lakes, ponds and wetlands.
 - c. Location(s) of buildings, parking areas, and other impervious surfaces.
 - d. Location of the buffer area on the parcel, including lengths of all boundary lines and total square footage of the entire buffer and all buffer zones.
 - e. The scale of the map, which must be smaller than 100 feet to the inch.
 - f. Date of map.
 - g. A small scale vicinity map and north arrow.
 - h. Location of proposed buffer disturbance, including lengths of all boundary lines and total square footage for each buffer zone. The boundary of the disturbed area

must include the following: the area of the footprint of the use within the buffer that is causing the impact to the buffer; the area of the boundary of any clearing and grading activities necessary to accommodate the use outside the footprint of the use; and the area of any ongoing maintenance corridors within the stream buffer associated with the use outside the footprint and clearing/grading limits of the use. Temporary equipment access areas are not included in the disturbed area calculation provided tree removal and grading are not required. These access areas must be shown on the map along with a note describing how these areas will be properly stabilized.

- i. General location (do not survey), number, size and species of trees greater than two (2) inches in diameter that will be removed from the buffer.

5.3 Section 2 – Finding of No Practical Alternative

Buffers are extremely important for protecting the quality and usability of Charlotte-Mecklenburg’s surface water resources. For this reason, Charlotte-Mecklenburg Storm Water Services wants to ensure that there is “no practical alternative” to the proposed buffer disturbance prior to its approval and subsequent issuance of an Authorization Certificate. The burden of proof for this determination lies with the applicant who must provide responses to the following in order for the application to be considered for approval.

- Explain why the basic project purpose cannot be practically accomplished in a manner that would better minimize the disturbance, preserve aquatic life and habitat, and protect water quality.
- Explain why the use cannot practically be reduced in size or density, reconfigured or redesigned to better minimize the disturbance, preserve aquatic life and habitat, and protect water quality.
- Describe practices that have been incorporated into the project to minimize the buffer disturbance, preserve aquatic life and habitat, and protect water quality.

In addition to the above, Charlotte-Mecklenburg Storm Water Services will consider the impacts that the buffer disturbance may have on the overall quality and usability of the surface water resource, including its ability to support varied species of aquatic life and meet applicable water quality standards. If after considering all available information it is determined by staff that the applicant has satisfied the burden of proof for a determination of “No Practical Alternative” and that the overall negative impacts to the quality and usability of downstream surface waters can be adequately mitigated, then Charlotte-Mecklenburg Storm Water Services will determine that no practical alternative exists. Such a determination is required for the issuance of an Authorization Certificate allowing the buffer disturbance (see Section 5.1).

5.4 Section 3 – Mitigation

The purpose of mitigation is to offset the effect of a buffer disturbance so there is minimal negative impact to surface water quality or aquatic life. Most of the potentially allowable buffer disturbances described in Section 4 require some form of mitigation, which varies significantly based on the type of buffer and the nature of the disturbance. In addition, Charlotte-Mecklenburg Storm Water Services may require mitigation for any buffer disturbance if it is

determined to be necessary for the protection of the quality and usability of downstream surface water resources and the propagation of aquatic life. Mitigation is also required for all illegal buffer disturbances but under these circumstances it is referred to as “Restoration.” All mitigation must be approved by Charlotte-Mecklenburg Storm Water Services before an Authorization Certificate Application allowing the disturbance can be approved. The applicant must include general information regarding the proposed mitigation in Section 3 of the application. A variety of additional information must be attached to the application to fully satisfy the submittal requirements for consideration of a proposed mitigation option. The following Sections describe the information that must be provided in Section 3 of the form as well as all additional information. Completion of the mitigation requirements specified below satisfies the second requirement for the issuance of an Authorization Certificate allowing a buffer disturbance (see Section 5.1), which specifies that the proposed mitigation must be sufficient to offset the negative impacts to the quality and usability of downstream surface waters associated with the buffer disturbance. On a case-by-case basis, Charlotte-Mecklenburg Storm Water Services may deviate from the requirements specified below when it is deemed necessary and appropriate for the protection of water quality.

5.4.1 Calculating the Total Disturbed Area in the Buffer

For mitigation purposes, the total disturbed area in the buffer is calculated by adding the following three (3) areas together without counting any area twice:

1. Area of the footprint of the use within the buffer that is causing the impact to the buffer;
2. Area of the boundary of any clearing and grading activities necessary to accommodate the use within the buffer outside the footprint of the use; and
3. Area of any ongoing maintenance corridors within the stream buffer associated with the use outside the footprint and clearing/grading limits of the use.

Temporary equipment access areas are not included in the disturbed area calculation provided tree removal and grading are not required and the area is properly stabilized. The map attached to the Authorization Certificate Application form as described in Section 5.2 must include the locations of the temporary access areas along with a note describing how these areas will be stabilized.

The following example calculation of the total disturbed area of a buffer is provided for clarification.

1. The proposed footprint within the buffer of a wastewater collection system and pump station is 1,000 square foot.
2. Trees must be cleared and the ground graded in an area covering 2,000 square feet of the buffer with 1,000 of these square feet located outside of the footprint from number 1 above.
3. A gravel driveway is proposed for access to the pump station for ongoing maintenance that includes 200 square feet in the buffer with 100 square feet outside the areas included in numbers 1 and 2 above.
4. The total disturbed area is calculated as follows: 1,000 square feet (footprint) + 1,000 square feet (clearing limits outside the footprint) + 100 square feet (maintenance corridor outside the footprint and clearing limits) = 2,100 square feet of disturbed area in the buffer.

5.4.2 Mitigating for Water Supply Watershed Buffer Disturbances

Unless otherwise approved by Charlotte-Mecklenburg Storm Water Services, the only option available for mitigating/restoring a water supply watershed buffer disturbance is Level 2 revegetation of an area equal or greater in size than the area disturbed based on the calculation method described in Section 5.4.1, except in Lower Lake Wylie where additional mitigation measures are allowed as described below. This revegetation area must be on the same parcel as the buffer disturbance. It is recommended that chemical fertilizers and pesticides not be applied in the buffer. Compost and other organic fertilizers should be used and the removal of invasive species should be accomplished by hand clearing. In addition, diffuse flow must be maintained through the buffer in perpetuity following buffer revegetation. The following information must be provided in Section 3 of the Authorization Certificate Application form for a proposed disturbance of a water supply watershed buffer.

- Verification that Level 2 revegetation will be used on the same parcel as the buffer disturbance.
- Verification that the size of the buffer revegetation area is equivalent or greater than the area of buffer disturbance that has been calculated as described above.

For all water supply watershed buffer mitigation, a Water Quality Buffer Revegetation Plan must be submitted along with the Authorization Certificate Application form. This Plan can be incorporated into the scaled map prepared in Section 1 of the application as described in Section 5.2 above. This Plan must be prepared in strict accordance with Section 6.4. The following information must be included on the Plan in addition to what is specified in Section 6.4 if the Plan is for mitigation associated with a disturbance of a water supply watershed buffer. A sample Water Quality Buffer Revegetation Plan is provided in Appendix 16.

- If the plan is being submitted for shoreline stabilization or dredging, it must clearly illustrate the location of equipment access and staging areas and the restoration plans for these areas.
- The percentage of built-upon area on the lot where the buffer disturbance and revegetation is to occur should be indicated in the “Notes” area of the Plan.

The property owner or designee must submit annual reports to Charlotte-Mecklenburg Storm Water Services for a period of five (5) years after the mitigation has been completed showing that the trees planted have survived and that diffuse flow through the stream buffer has been maintained. This report must include a statement as to the number and percentage of trees that are surviving and the number of trees replanted. The report should also include a statement as to whether diffuse flow through the buffer has been maintained. Photographs of the mitigation area showing trees and ground cover must be attached to the report. The property owner or designee should replace all dead and restore diffuse flow as needed prior to submitting this report.

One exception to the above described process occurs with the buffer requirements for Lower Lake Wylie in the City of Charlotte, which includes a provision allowing staff to pre-approve buffer disturbances in the event of a legitimate hardship. The mitigation techniques described below are included in the ordinance. **IMPORTANT NOTE:** Always receive approval from Charlotte’s Zoning Administrator prior to initiating the review process for a proposed disturbance to a Lower Lake Wylie buffer. It is very likely that approval from the Zoning Board

of Adjustment (ZBA) will be required. If the Zoning Administrator determines that ZBA approval is not required and that the normal review process can occur, then the process described in Section 5.5 will be followed.

- **Buffer Restoration:** The owner may restore and preserve the buffer area on any stream of equivalent or greater drainage area within the Lower Lake Wylie Watershed area the condition of which is determined to be qualified for restoration by the Mecklenburg County Environmental Protection Department on a 1:1 basis utilizing the square feet of buffer impacted. This restoration shall include stream bank improvements.
- **Buffer Preservation:** The owner may purchase, fee simple, other stream segments at equivalent or greater drainage area on a 1:1 square foot basis and convey fee simple and absolute title to the land to the City/County or other conservation organization.
- **Mitigation Credits:** The purchase of mitigation credits on a 1:1 basis utilizing the square feet of buffer impacted and the established rate of purchase of \$10/square foot shall allow for stream buffer impacts on the specific site. Mitigation credits purchased under any other program (i.e., U.S. Army Corp of Engineers) shall not cover this requirement unless the issuing agency agrees to relinquish the funds to the appropriate City/County agency.

A second exception to the above described process occurs with certain minor buffer disturbances for which an abbreviated review process has been established as described in Section 5.7.

5.4.3 Mitigating for S.W.I.M. and Post-Construction Buffer Disturbances

As previously discussed in Section 4, the post-construction buffer requirements for all the jurisdictions in Charlotte-Mecklenburg specify that the provisions of the S.W.I.M. ordinances apply to post-construction buffers, including the mitigation provisions. The S.W.I.M. buffer ordinances for the City of Charlotte and Mecklenburg County as well as the Towns of Mint Hill and Pineville identify eight (8) pre-approved mitigation techniques as described below. This is considered “by-right” mitigation, meaning the mitigation option is not to be denied if the buffer disturbance is demonstrated to have “no practical alternatives.” For the Towns of Cornelius, Davidson and Matthews, no pre-approved mitigation techniques are identified and “by-right” mitigation does not exist. All S.W.I.M. buffer disturbances for the Towns of Cornelius, Davidson and Matthews not specifically allowed by their S.W.I.M. ordinances must obtain a variance from the Zoning Board of Adjustment for the jurisdiction prior to the initiation of any buffer disturbance activity. For the Town of Cornelius, the Zoning Board of Adjustment must also issue a variance for any disturbance of the post-construction buffer not specifically allowed by the post-construction ordinance. In the Towns of Davidson and Huntersville, variances for post-construction buffer disturbances are considered by the Charlotte-Mecklenburg Storm Water Advisory Committee as specified in the Towns’ post-construction ordinances and not by their Zoning Board of Adjustments. These variances are oftentimes difficult to obtain. The Town of Huntersville identifies in their S.W.I.M. buffer ordinance the eight (8) mitigation techniques described below; however, they are not referred to as pre-approved and like the Towns of Davidson and Matthews all buffer disturbances not specifically allowed by the ordinance must receive a variance from the Town’s Zoning Board of Adjustment. For all jurisdictions, mitigation should be performed in the same basin as the allowed buffer disturbance based on the following 19 basin delineations: Sugar/Irwin, Little Sugar/Briar, McMullen, McAlpine, Four Mile, Six Mile, Stevens/Goose, Clear, McKee, Reedy, Back, Mallard, Clarks, Rocky River,



McDowell, Gar, Long, Paw, and Steele. Deviations from this policy are allowed provided it is in the best interest of water quality.

Provided below are the eight (8) pre-approved mitigation techniques for S.W.I.M. and post-construction buffer disturbances in the City of Charlotte and Mecklenburg County as well as the Towns of Cornelius, Mint Hill and Pineville. An applicant can propose alternative mitigation measures to those specified below; however, prior to consideration by staff the applicant must demonstrate that the alternative measure will result in a net improvement in water quality compared to pre-development conditions. This proof must include the use of water quality modeling or other means determined to be appropriate by staff. A description of the alternative mitigation measure and proof of its effectiveness must be attached to the Authorization Certificate Application form when submitted for review. **IMPORTANT NOTE:** If the parcel is subject to an ordinance that requires the implementation of one or more of these techniques, such as water supply watershed protection or post-construction, then those techniques are not available for use on the parcel to mitigate for a buffer disturbance.

1. Installation of Structural Best Management Practices (BMPs)

This mitigation option requires the installation of single or multiple structural BMPs designed to meet the criteria described below. This mitigation option must be fulfilled by installing a structural BMP to achieve an average annual 85% total suspended solids (TSS) removal efficiency for runoff generated from the first inch of rainfall from the built-upon area on the property where the buffer impact occurs. All BMPs used to fulfill this 85% TSS removal requirement must comply with the criteria specified in the most recent edition of the Charlotte-Mecklenburg BMP Design Manual that is available on the following website: <http://stormwater.charmeck.org> (select “Regulations”, select “Post-Construction Programs & Manuals”, select “Mecklenburg County, Towns of”, select “Charlotte-Mecklenburg BMP Design Manual”). The following information must be included in Section 3 of the Authorization Certificate Application:

- Type of BMP or infiltration method;
- Size of drainage area to be treated (acres); and
- Percentage of impervious cover in this drainage area.

In addition, the location and dimensions of the BMP(s) and maintenance easements must be delineated on the scaled map prepared in Section 1 of the application as described in Section 5.2 above. If the Authorization Certificate is issued for the proposed buffer disturbance, the applicant will be notified in writing by Charlotte-Mecklenburg Storm Water Services and made aware that the following additional information must be provided for review prior to the release of building permits for the project (see Appendix 17):

- Construction plans must be provided that have been sealed by a professional engineer.
- An Operation and Maintenance Agreement and Maintenance Plan must be provided for each BMP. The purpose of these maintenance agreements and plans is to ensure that all structures are satisfactorily maintained in perpetuity. Digital versions of these documents are available on the website indicated above by selecting “Forms” instead of “Charlotte-Mecklenburg BMP Design Manual.” The

maintenance of all structures installed for buffer mitigation is the responsibility of the owner or designee who must ensure that they are inspected by a qualified professional for compliance with approved plans and specifications on at least an annual basis. Any deficiencies detected as a result of these inspections must be corrected immediately. Inspection forms are available at the above website under “Forms” and “BMP Maintenance and Inspection Checklists.” These completed forms must be mailed to the attention of the Mecklenburg County Water Quality Program Manager at Charlotte-Mecklenburg Storm Water Services, 700 N. Tryon Street, Charlotte, N.C. 28202.

- All the requirements associated with the installation of BMPs for compliance with post-construction ordinance requirements must be satisfied in addition to the requirements specified above.

Following the installation of the BMP(s) and prior to the release of Certificates of Occupancy, Charlotte-Mecklenburg Storm Water Services will conduct inspections to ensure compliance with construction plans. Following approval, an as-built drawing for each BMP must be submitted to Charlotte-Mecklenburg Storm Water Services for approval. A copy of a recorded plat showing the location and dimensions of each structure, including maintenance easements for BMPs, must be provided to Charlotte-Mecklenburg Storm Water Services for approval. Each structure must be labeled on the plat as a “Water Quality Treatment Device – Do Not Disturb.” In addition, the approved Operation and Maintenance Agreement and Maintenance Plan must be recorded and a copy provided to Charlotte-Mecklenburg Storm Water Services.

2. Stream Buffer Restoration – An area located on the same parcel as the buffer disturbance that is equal or greater in size compared to the total disturbed area of the buffer and each buffer zone must be revegetated and preserved in perpetuity. The total area of the buffer disturbance must be calculated using the method described in Section 5.4.1. In order to qualify for mitigation, the area proposed for restoration must be lacking in adequate vegetative cover to the extent that the restoration will result in the significant enhancement of the sites overall water quality buffering capabilities compared to predevelopment conditions. At a minimum, the number of trees located in the water quality buffer for the site should increase by a minimum of 50% over predevelopment conditions as a result of the restoration. The following information must be included in Section 3 of the Application for an Authorization Certification:
 - Verification of the proposed type of buffer revegetation, including Level 1 or Level 2.
 - Verification that the size of the restoration area is equivalent or greater than the area of buffer disturbance, including each buffer zone.

A Water Quality Buffer Revegetation Plan must be submitted along with the Authorization Certificate Application form. This Plan can be incorporated into the scaled map prepared in Section 1 of the application as described in Section 5.2 above. This Plan must be prepared in strict accordance with Section 6.4. A sample Water Quality Buffer Revegetation Plan is provided in Appendix 16. The following additional requirement

applies to stream buffer restorations performed for mitigation of a S.W.I.M. and post-construction buffer disturbance:

- To prevent future disturbance of the stream buffer restoration area, the full extent of the area must be delineated on a map produced by a N.C. Registered Surveyor that also shows all parcel and buffer boundaries. The following language must be included on the map identifying the buffer restoration area: “Water Quality Buffer Restoration Area - Disturbance of this area is strictly prohibited by law.” This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.

The applicant must submit annual reports to Charlotte-Mecklenburg Storm Water Services for a period of five (5) years after the mitigation has been completed showing that the trees planted have survived and that diffuse flow through the stream buffer has been maintained. This report must include a statement as to the number and percentage of trees that are surviving and the number of trees replanted. Photographs of the mitigation area showing trees and ground cover must be attached to the report. The property owner or designee should replace all dead and restore diffuse flow as needed prior to submitting this report.

3. Stream Buffer Preservation – A parcel with equivalent or greater buffer area than the area of the buffer being disturbed, including each buffer zone, must be preserved in perpetuity by conveying the parcel fee simple to the City, County or conservation organization. Staff may consider other means for preserving this parcel on a case-by-case basis. The total area of the buffer disturbance must be calculated using the method described in Section 5.4.1. The stream buffer preservation area cannot include any area that is subject to water quality buffer or open space requirements. This must be an area that if not preserved for buffer mitigation would be available for development. The upstream drainage area of the buffered stream on the donated parcel must be similar in size ($\pm 10\%$) to the buffered stream on the impacted parcel. Charlotte-Mecklenburg Storm Water Services reserves the right to reject a parcel based on the findings of a Phase I Environmental Site Evaluation as well as other conditions that are determined to render the parcel unsuitable as a buffer preservation area. The following information must be included in Section 3 of the Application for an Authorization Certification:

- Verification that the size of the buffer preservation area is equivalent or greater than the area of buffer disturbance, including each buffer zone.

The following information must be attached to the Authorization Certificate Application form:

- Scaled map showing the boundaries of the property to be donated along with the specific location and dimensions of the buffer preservation area, including the delineation of each buffer zone and the square footage in each zone. The map must also illustrate the location and dimensions of any existing structures and easements on the property as well as the quantity, type and size of existing trees and other vegetative cover.
- A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified

by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.

- A current appraisal of the value of the property performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734.
 - A title certificate.
 - A Phase I Environmental Site Assessment report prepared in accordance with American Society for Testing and Methods (ASTM) Standard 1527-05.
 - Written verification of the method for providing continued protection of the buffer through conservation easement or other means deemed acceptable by staff.
4. Wetlands Preservation – A parcel containing a certified wetland covering twice the area of the buffer disturbance must be preserved in perpetuity by conveying the parcel fee simple to the City, County or conservation organization. Staff may consider other means for preserving this parcel on a case-by-case basis. The total area of the buffer disturbance must be calculated using the method described in Section 5.4.1. The wetland preservation area cannot include any area that is subject to water quality buffer or open space requirements. This must be an area that if not preserved for buffer mitigation would be available for development. Charlotte-Mecklenburg Storm Water Services reserves the right to reject a parcel based on the findings of a Phase I Environmental Site Evaluation as well as other conditions that are determined to render the parcel unsuitable as a wetland preservation area. The following information must be included in Section 3 of the Application for an Authorization Certification:
- Verification that the size of the wetland preservation area is equivalent or greater than twice the area of buffer disturbance.

The following information must be attached to the Authorization Certificate Application form:

- Scaled map showing the boundaries of the property to be donated along with the specific location and dimensions of the wetland preservation area. The map must also illustrate the location and dimensions of any existing structures and easements on the property as well as the quantity, type and size of existing trees and other vegetative cover.
- A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.

- A current appraisal of the value of the property performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734.
 - Written certification by a wetlands specialist that the area to be preserved meets the criteria for wetland delineation.
 - A title certificate.
 - A Phase I Environmental Site Assessment report prepared in accordance with American Society for Testing and Methods (ASTM) Standard 1527-05.
 - Written verification of the method for providing continued protection of the wetland through conservation easement or other means deemed acceptable by staff.
5. Bottom Land Hardwood Preservation – A parcel containing bottom land hardwoods covering twice the area of the buffer disturbance must be preserved in perpetuity by conveying the parcel fee simple to the City, County or conservation organization. Staff may consider other means for preserving this parcel on a case-by-case basis. The total area of the buffer disturbance must be calculated using the method described in Section 5.4.1. The bottom land hardwood preservation area cannot include any area that is subject to water quality buffer or open space requirements. This must be an area that if not preserved for buffer mitigation would be available for development. Charlotte-Mecklenburg Storm Water Services reserves the right to reject a parcel based on the findings of a Phase I Environmental Site Evaluation as well as other conditions that are determined to render the parcel unsuitable as a nature preserve. The following information must be included in Section 3 of the Authorization Certification Application:
- Calculations verifying that the size of the bottom land hardwood preservation area is twice the size of the area of buffer being disturbed.

The following information must be attached to the Authorization Certificate Application form:

- Scaled map showing the boundaries of the property to be donated along with the specific location and dimensions of the bottom land hardwood preservation area. The map must also illustrate the location and dimensions of any existing structures and easements on the property as well as the quantity, type and size of existing trees and other vegetative cover.
- A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.
- A current appraisal of the value of the property performed in accordance with the procedures of the North Carolina Department of Administration, State Property

Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734.

- A title certificate.
- A Phase I Environmental Site Assessment report prepared in accordance with American Society for Testing and Methods (ASTM) Standard 1527-05.
- Written verification of the method for providing continued protection of the bottom land hardwood through conservation easement or other means deemed acceptable by staff.

6. Controlled Impervious Cover – Impervious cover on the parcel where the buffer disturbance is proposed must be equal to or less than 24%. Preservation of the stream side zone is encouraged. If the developed parcel is subject to water supply watershed protection or post-construction regulations, both of which have impervious area limits, then this mitigation option is not available for use. The following information must be included in Section 3 of the Application for an Authorization Certification:

- Calculations verifying that the total impervious area on the parcel is equal to or less than 24%.

The following information must be attached to the Authorization Certificate Application form:

- To prevent impervious area from increasing beyond 24%, the full extent of all impervious cover must be delineated on a map produced by a N.C. Registered Surveyor that also shows all parcel and buffer boundaries. The following language must be included on the map: "Water Quality Buffer Mitigation Area - Disturbance of this area is strictly prohibited by law." This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.

7. Open Space Development – Preserve as undisturbed open space at least 50% of the total land area of the site where the buffer disturbance is proposed. No land clearing, grading, removal of vegetation or other disturbance can occur in this area. This open space cannot include any area that is subject to water quality buffer or open space requirements. This must be area that if not preserved for buffer mitigation would be available for development. Preservation of the stream side zone is encouraged. The following information must be included in Section 3 of the Application for an Authorization Certification:

- Calculations verifying that the open space on the parcel is equal to or greater than 50%.

The following information must be attached to the Authorization Certificate Application form:

- Scaled map showing the boundaries of the open space area. The map must also illustrate the location and dimensions of all structures and easements on the property as well as the quantity, type and size of existing trees and other vegetative cover. Since this undisturbed open space is required to be on the same

parcel as the proposed buffer disturbance, the map prepared in Section 1 of the Authorization Certificate Application form as described in Section 5.2 of this document should be used as a base map for illustrating this undisturbed open space area.

- A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.
 - To prevent the future disturbance of this open space, the full extent of all open space must be delineated on a map produced by a N.C. Registered Surveyor that also shows all parcel and buffer boundaries. The following language must be included on the map: "Water Quality Buffer Mitigation Area - Disturbance of this area is strictly prohibited by law." This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.
8. **Mitigation Credits** – Mitigation credits may be purchased on a 1:1 basis utilizing the square feet of the disturbed area and the prevailing rate of \$10 / square foot. The total area of the buffer disturbance must be calculated using the method described in Section 5.4.1. The mitigation money will be incorporated into the Stream Buffer Mitigation Fund maintained by Charlotte-Mecklenburg Storm Water Services. Monies from this Fund will be used to improve water quality conditions through stream and/or buffer restoration, open space preservation, installation of BMPs or other means deemed appropriate by that agency. Preservation of the stream side zone is encouraged. The following information must be included in Section 3 of the Application for an Authorization Certification:
- Calculations verifying the size of the proposed buffer impact and the associated total mitigation cost.

The mitigation fee must be paid in full prior to the initiation of the approved buffer disturbance activity. Charlotte-Mecklenburg Storm Water Services will review the fee every two (2) years and compare it to the actual cost of restoration activities conducted by local and State agencies, including site identification, planning, implementation, monitoring and maintenance costs. Based upon this biennial review, Charlotte-Mecklenburg Storm Water Services will recommend revisions to the above fee as deemed necessary.

An exception to the above described process occurs with certain minor buffer disturbances for which an abbreviated review process has been established as described in Section 5.7.

5.4.4 Mitigating for Goose Creek and Six Mile Creek Buffer Disturbances

Mitigation is required for specific buffer disturbances in Goose and Six Mile Creeks as indicated

in Appendix 6. In addition, Charlotte-Mecklenburg Storm Water Services may attach conditions to the Authorization Certificate for buffer disturbances in Goose and Six Mile Creeks that support the purpose, spirit and intent of the stream buffer protection program. The required mitigation area is determined by applying the following multipliers to the total disturbed area in each zone using the calculation method described in Section 5.4.1:

1. Disturbances to the stream buffer must be multiplied by three (3);
2. Disturbances to wetlands within the stream buffer that are subject to mitigation under 15A NCAC 02H .0506 must comply with the mitigation ratios in 15A NCAC 02H .0506 as follows:

“Restoration is the preferred method of wetlands mitigation. The other methods may be utilized if the applicant can demonstrate that restoration is not practical or that the proposed alternative is the most ecologically viable method of replacing the lost functions and values. All mitigation proposals shall provide for the replacement of wetland acres lost due to the proposed activity at a minimum of a 1:1 ratio through restoration or creation prior to utilizing enhancement or preservation to satisfy the mitigation requirements, unless the Director determines that the public good would be better served by other types of mitigation. Wetlands mitigation shall be conducted based on the following ratios (acres mitigated to acres loss); 4:1, for wetlands located within 150 feet of the mean high water line or normal water level of any perennial or intermittent water body as shown by the most recently published version of the United States Geological Survey 1:24,000 (7.5 minute) scale topographical map; 2:1, for wetlands located between 150 feet and 1,000 feet from the mean high water line or normal water level of any perennial or intermittent water body as shown by the most recently published version of the United States Geological Survey 1:24,000 (7.5 minute) scale topographical map; and 1:1, for all other wetlands. For linear projects which impact less than 3 acres of wetlands the ratio shall be 2:1 regardless of the distance from surface waters. The above ratios apply only to restoration. The acres of required mitigation for the other types of mitigation shall be determined by multiplying the above ratios by 1.5 for creation, 2 for enhancement, and 5 for preservation. The above ratios do not apply to approved mitigation sites where the state and federal review agencies have approved credit/debit ratios. This Subparagraph shall not apply to general certifications until the Department has established a wetlands restoration program or until January 1, 1997, whichever occurs first.”

All mitigation must be performed in the same watershed where the buffer disturbance occurred, including either Goose Creek or Six Mile Creek and any of their tributaries. Mitigation should occur as close as possible to the location of the buffer disturbance. Provided below is a description of the mitigation options available for buffer disturbances in Goose and Six Mile Creeks. Charlotte-Mecklenburg Storm Water Services may consider mitigation options other than those described below provided they meet the purpose and intent of the governing ordinance.

1. Payment to the Stream Buffer Restoration Fund – Payment into the Stream Buffer Mitigation Fund maintained by Charlotte-Mecklenburg Storm Water Services may be used to partially or fully mitigate for stream buffer disturbances. Monies from the Fund

will be used to provide for the improvement of water quality conditions through stream and/or buffer restoration, open space preservation, installation of BMPs or other means deemed appropriate by Charlotte-Mecklenburg Storm Water Services. The amount of payment into the Fund is determined by multiplying the acres or square feet of required mitigation area calculated using the method described in Section 5.4.1 above by ninety-six cents (\$.96) per square foot or forty-one thousand, six hundred and twenty-five dollars (\$41,625) per acre. The following information must be included in Section 3 of the Application for an Authorization Certification:

- Calculations verifying the size of the proposed buffer impact and associated total mitigation cost.

The fee must be paid in full prior to the initiation of the approved buffer disturbance activity. The payment of a compensatory mitigation fee may be fully or partially satisfied by the donation of real property interests as described in number 2 below. Charlotte-Mecklenburg Storm Water Services will review the fee every two (2) years and compare it to the actual cost of restoration activities conducted by local and State agencies, including site identification, planning, implementation, monitoring and maintenance costs. Based upon this biennial review, Charlotte-Mecklenburg Storm Water Services will recommend revisions to the above fee as deemed necessary.

2. Donation of Property – The donation of real property interests may be used to either partially or fully satisfy the payment of a compensatory mitigation fee to the Stream Buffer Restoration Fund as described above. The value of the property interest will be determined by a current appraisal performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734. The donation will satisfy the mitigation determination if the appraised value of the donated property interest is equal to or greater than the required fee. If the appraised value of the donated property interest is less than the required fee calculated using the method described above, the applicant will pay the remaining balance due. The donation of conservation easements to satisfy compensatory mitigation requirements will be accepted only if the conservation easement is granted in perpetuity. Donation of real property interests to satisfy the mitigation determination will be accepted only if such property meets all of the following requirements:
 - The property is located within an area that is identified as a priority for restoration in the Basinwide Wetlands and Stream Restoration Plan developed by the N.C. Division of Water Quality pursuant to G.S. 143-214.10 or will be located at a site that is otherwise consistent with the goals outlined in the Basinwide Wetlands and Stream Restoration Plan.
 - The property contains stream areas for restoration, defined in 15A NCAC 02B .0243, not currently protected by the State's stream buffer protection program.
 - The size of the restorable stream buffer on the property to be donated is equal to or greater than the acreage of stream buffer required to be mitigated.

- The property will not require excessive measures for successful restoration, such as removal of structures or infrastructure. Restoration of the property will be capable of fully offsetting the adverse impacts of the requested use.
- The property is suitable to be successfully restored, based on existing hydrology, soils, and vegetation.
- The estimated cost of restoring and maintaining the property does not exceed the value of the property minus site identification and land acquisition costs.
- The property does not contain any building, structure, object, site, or district that is listed in the National Register of Historic Places established pursuant to Public Law 89-665, 16 U.S.C. 470 as amended.
- The property does not contain any hazardous substance or solid waste.
- The property does not contain structures or materials that present health or safety problems to the general public. If wells, septic, water or sewer connections exist, they will be filled, remediated or closed at owner's expense in accordance with state and local health and safety regulations.
- The property and adjacent properties do not have prior, current, and known future land use that would inhibit the function of the restoration effort.
- The property will not have any encumbrances or conditions on the transfer of the property interests.

The following information must be included in Section 3 of the Application for an Authorization Certification:

- Calculations verifying that the appraised value of the donated property interest is equal to or greater than the necessary payment to the Stream Buffer Restoration Fund calculated in number 1 above.

The following information must be attached to the Authorization Certificate Application form:

- U.S. Geological Survey 1:24,000 (7.5 minute) scale topographic map, county tax map, USDA Natural Resource Conservation Service County Soil Survey Map, and county road map showing the location of the property to be donated along with information on existing site conditions, vegetation types, presence of existing structures and easements.
- A current property survey performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the State Board of Registration for Professional Engineers and Land Surveyors in "Standards of Practice for Land Surveying in North Carolina." Copies may be obtained from the North Carolina State Board of Registration for Professional Engineers and Land Surveyors, 3620 Six Forks Road, Suite 300, Raleigh, North Carolina 27609.
- A current appraisal of the value of the property performed in accordance with the procedures of the North Carolina Department of Administration, State Property Office as identified by the Appraisal Board in the "Uniform Standards of Professional North Carolina Appraisal Practice." Copies may be obtained from the Appraisal Foundation, Publications Department, P.O. Box 96734, Washington, D.C. 20090-6734.

- A title certificate.
 - A Phase I Environmental Site Assessment report prepared in accordance with American Society for Testing and Methods (ASTM) Standard 1527-05.
3. Stream Buffer Restoration or Enhancement – The applicant may restore or enhance a stream buffer to fulfill the mitigation requirements for authorized buffer disturbances if either of the following applies:
- The area of stream buffer restoration is equal to the required mitigation area determined using the methodology described in Section 5.4.1 above.
 - The area of stream buffer enhancement is three (3) times larger than the required mitigation area determined using the methodology described in Section 5.4.1 above.

Stream buffer restoration is defined as the process of converting a non-forested riparian area, where woody vegetation is absent (less than 100 trees per acre) to a forested riparian buffer area. Stream buffer enhancement is defined as the process of converting a non-forested riparian area, where woody vegetation is sparse (greater than or equal to 100 trees per acre but less than 200 trees per acre) to a forested riparian buffer area. The stream buffer restoration or enhancement site must be located within the same watershed where the buffer disturbance occurred, including either Goose or Six Mile Creeks and their tributaries, and must be as close to the location of the disturbance as feasible. The stream buffer restoration or enhancement site must have a minimum width of 50 feet as measured horizontally on a line perpendicular to the surface water and may include the following:

- Restoration/enhancement of existing stream areas.
- Restoration/enhancement and respective preservation of stream side areas when the stream is not depicted on USGS map or Soil Survey.
- Preservation of stream side areas when the stream is not depicted on USGS map or Soil Survey.
- Restoration/enhancement and respective preservation of stream side areas along first order ephemeral streams that discharge/outlet into intermittent or perennial streams.
- Preservation of the stream side area along first order ephemeral streams that discharge/outlet intermittent or perennial stream.

The following information must be included in Section 3 of the Application for an Authorization Certification:

- Calculations verifying that the size of the buffer restoration is equal to the required mitigation area determined using the methodology described Section 5.4.1 above.
- or**
- The area of stream buffer enhancement is three (3) times larger than the required mitigation area determined using the methodology described in Section 5.4.1 above.

For all buffer restorations and enhancements in the Goose and Six Mile Creeks, compliance with the Level 2 revegetation criteria specified in Section 6.1.2 is required unless otherwise approved by Charlotte-Mecklenburg Storm Water Services. In addition, diffuse flow must be maintained through the buffer in perpetuity. A Water Quality Buffer Revegetation Plan must be submitted along with the Authorization Certificate Application form. This Plan can be incorporated into the scaled map prepared in Section 1 of the application as described in Section 5.2 above. This Plan must be prepared in strict accordance with Section 6.4. A sample Water Quality Buffer Revegetation Plan is provided in Appendix 16.

The stream buffer restoration or enhancement must be completed by the deadline indicated in the Authorization Certificate, which cannot exceed one year from the approval date. An inspection will be performed by Charlotte-Mecklenburg Storm Water Services as described in Section 5.1. The following additional requirement applies to stream buffer restorations and enhancements performed for mitigation of a buffer disturbance.

- To prevent future disturbance of the stream buffer restoration area, the full extent of the stream buffer restoration area must be delineated on a map produced by a N.C. Registered Surveyor that shows all parcel boundaries. The following language must be included on the map identifying the buffer restoration area: “Water Quality Buffer Restoration Area - Disturbance of this area is strictly prohibited by law.” This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.
- Written verification of the method for providing continued protection of the area through a perpetual conservation easement or other acceptable means that will provide for protection of the property in perpetuity. If proof that both the above requirements have been met is not presented within one year of approval, then the applicant will be in violation of this ordinance and subject to remedies and penalties.

The applicant must submit annual reports to Charlotte-Mecklenburg Storm Water Services for a period of five (5) years after the mitigation has been completed showing that the trees planted have survived and that diffuse flow through the stream buffer has been maintained. This report must include a statement as to the number and percentage of trees that are surviving and the number of trees replanted. Photographs of the mitigation area showing trees and ground cover must be attached to the report. The property owner or designee should replace all dead and restore diffuse flow as needed prior to submitting this report.

An exception to the above described process occurs with certain minor buffer disturbances for which an abbreviated review process has been established as described in Section 5.7.

5.4.5 Mitigating for Unauthorized (Illegal) Buffer Disturbances

For all unauthorized/illegal buffer disturbances, a Notice of Violation (NOV) will be issued to

the property owner (see Appendix 18) except for water supply watershed and S.W.I.M. buffer violations that fall under Zoning Ordinances in which case a Corrective Action Request (CAR) will be issued (see Appendix 19). A different CAR must be used for the Town of Cornelius (see Appendix 20). The property owner will be notified to submit an Authorization Certificate Application form with an attached Water Quality Buffer Revegetation Plan to the inspector at the address provided within no more than 30 days. This Application and Plan must be written in strict accordance with Section 6.4 of this document and must adhere to the Level 2 revegetation criteria as well as the planting and species diversity requirements specified in Sections 6.1.2, 6.2 and 6.3 of this document. The inspector will complete a review of the documents within three (3) work days of receipt. If disapproved, a letter will be sent to the property owner notifying them of the disapproval and all deficiencies (see Appendix 21). The letter will also provide a deadline for submittal of a revised Application and Plan that addresses the identified deficiencies. This deadline shall not be more than two (2) weeks from the date of the disapproval letter. Once the Application and Plan are approved, a letter will be sent to the property owner setting a deadline for the completion of the activities specified in the Plan, including installing all plants, mulch, etc (see Appendix 22). This deadline may vary to coincide with Mecklenburg County's planting season, which typically runs from November through early March. For example, if the Plan is approved in May, the inspector may want to set the deadline in November to coincide with the planting season. If the Plan is approved in February, a deadline may be set for early March to avoid running past the planting season. However, the deadline must be within one (1) year of approval of the plan. To prevent future disturbance of the stream buffer restoration area, the full extent of the area must be delineated on a map produced by a N.C. Registered Surveyor that also shows all parcel and buffer boundaries. The following language must be included on the map identifying the buffer restoration area: "Water Quality Buffer Restoration Area - Disturbance of this area is strictly prohibited by law." This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.

Within no more than two (2) work days following the deadline established in the approval letter, staff will conduct an inspection of the property to determine compliance. If noncompliance is identified, a second NOV will be issued to the property owner notifying them of the corrective actions necessary and the deadline for completion (see Appendix 23). Follow up inspections will be conducted by staff within no more than two (2) work days of this deadline. Upon determining compliance, staff will issue notification to the property owner (see Appendix 24).

Permit and/or Occupancy Holds may also be placed on properties that are in violation in order to ensure compliance with applicable regulations.

If at any point during the process outlined above, the violator fails to make substantial progress toward compliance, a supervisor will be notified for consideration of enforcement action.

5.5 Inspections

The purpose of inspections is to ensure compliance with the requirements of the applicable water quality buffer requirements and verify that buffer disturbances are properly mitigated as per the

approved mitigation plan. The inspections performed by Charlotte-Mecklenburg Storm Water Services are described below.

1. Prior to approval of a requested water quality buffer disturbance, assigned staff will perform an initial site inspection to verify the existing conditions of the stream and buffer. Digital pictures will be taken for documentation.
2. Assigned staff will conduct a field evaluation within three (3) work days following the specified completion date of mitigation activities to ensure that negative water quality impacts have not occurred as a result of the buffer disturbance and that mitigation measures have been fully installed in compliance with the approved mitigation plan.
3. Assigned staff will conduct field evaluations of approved buffer impacts and associated mitigation measures at a minimum of once every five (5) years following the installation and approval of the mitigation measure. Any documented failure of the functionality of a mitigation measure will result in the issuance of a NOV or CAR (see Appendices 25 and 26). If the owner fails to complete the necessary corrective actions within the time period specified, the matter will be referred for issuance of possible fines.
4. Charlotte-Mecklenburg Storm Water Services will conduct inspections of buffers while performing annual stream walk activities. All water quality buffer violations will be documented and the necessary follow up actions conducted to ensure compliance.
5. For all inspection activities, an inspection report must be created in Cityworks Server and the inspection must be tied to a GIS point. In addition, the following spreadsheet must be updated with all inspection activities: G:\WQ_Xfer\WQ\Buffers\Mitigation Records.

5.6 Documentation

The following documentation is to be completed for activities related to water quality buffers:

1. Complete an Activity Report under “Administration” in Cityworks Server documenting who, what, when, where, how and why, as well as whether the application was approved or denied. Attach to the Activity Report the application, associated attachments and all letters as well as pre-development pictures of the site.
2. Complete the Excel spreadsheet located on the LAN as follows:
G:\WQ_Xfer\WQ\Buffers\Mitigation Record. Obtain from this spreadsheet the next Case Number in the far left column and indicate this number preceded by the calendar year as the “Authorization Certificate Number ____” in all correspondence.
3. Following a site inspection verifying that mitigation has been completed, finalize the Activity Report established in number 1 above. Document in the Activity Report all site inspections conducted. Take pictures of completed mitigation and attach to the Activity Report. Also attach to the report all recorded documents described in Section 5.5.1 above. Forward the Activity Report to your Supervisor for closure.
4. For all inspection activities, an inspection report must be created in Cityworks Server and the inspection must be tied to a GIS point. In addition, the following spreadsheet must be updated with all inspection activities: G:\WQ_Xfer\WQ\Buffers\Mitigation Records. The date of the inspection, identification of deficiencies and whether the deficiencies were corrected will be documented in the far right column of this spreadsheet called “Site Inspections Following Installation (every 5 years).” Forward all Cityworks Server inspection reports to the Supervisor for review and closure.

5.7 Abbreviated Review Process for a Proposed Buffer Disturbance

Some proposed minor disturbances to water quality buffers are allowed to follow an abbreviated review process at the discretion of the Supervisor or Program Manager. For S.W.I.M. and post-construction buffers, minor disturbances are considered those that impact less than 100 square feet of the upland and/or managed use zones. Any impact to the stream side zone would not be considered a minor disturbance and must follow the normal review process. For Goose, Six Mile and water supply watershed buffers, minor disturbance would include the removal of a small number of trees (usually less than 5) to accomplish a permitted activity such as shoreline stabilization or stream restoration or the removal of a small number of trees (usually less than 3) to eliminate a threat to structures and/or public safety.

The extent and nature of the abbreviated process is left to the discretion of the supervisor provided the minimum criteria specified below are met (see Appendix 34).

- The applicant must submit a written request for approval of a proposed buffer disturbance. This request must include a written mitigation plan of sufficient detail to accurately describe the mitigation measure(s) and the time frame for completion. The request and plan can be submitted in the form of a letter or email.
- The request and plan must include the location, type and size of the proposed disturbed and mitigation areas (including each buffer zone if applicable) as well as the name, address and phone number of the property owner.
- The plan must include a statement that the mitigation measure will be maintained in perpetuity.
- Staff must conduct an inspection to ensure activities are performed in accordance with the approved plan.
- All activities must be documented in Cityworks.
- The appropriate information must be entered in the Mitigation Record located on the LAN as follows: G:\WQ_Xfer\WQ\Buffers\Mitigation Record.

5.8 Standard Review Process for a Proposed Buffer Disturbance

If the buffer disturbance exceeds the requirements for an abbreviated review process as described in Section 5.7 above, then the standard review process as described in this Section will be followed. The standard review process for a proposed buffer disturbance includes four (4) major components as follows:

1. Receive applicable information and document.
2. Determine if there is no practical alternative to the buffer disturbance.
3. Determine if the proposed mitigation measure is adequate to offset the negative water quality impacts associated with the proposed buffer disturbance.
4. Conduct inspections to ensure the proper installation of the mitigation measures and stabilization of the disturbed area.

Provided below is a summary of the standard review process for a proposed buffer disturbance. A flowchart of the process is provided in Appendix 34.

1. For all proposed buffer disturbances that are not considered minor as described in Section 5.7 above, an Authorization Certificate Application and attachments must be submitted to

- Charlotte-Mecklenburg Storm Water Services. The Supervisor will assign staff for follow up in Cityworks. If greater than 25 percent of the entire buffer area or any of the stream side zone is impacted, then the application should be reviewed by a Supervisor.
2. For shoreline stabilization and excavation projects on the lakes, the owner or contractor submits a project application to Duke Energy and a copy is provided to Charlotte-Mecklenburg Storm Water Services. The Supervisor sends a letter to the property owner and contractor making them aware of the buffer requirements (see Appendix 27). If as a result of the required pre-construction meeting, staff determine that mitigation is required for the disturbance then the owner is informed to submit an Authorization Certificate Application. Following the receipt of the application, the Supervisor will assign staff for follow up in Cityworks.
 3. Assigned staff will enter all applicable information into the Mitigation Records maintained on the LAN as follows: G:\WQ_Xfer\WQ\Buffers\Mitigation Records.xls. Staff will obtain the next certification number off this table and enter it on the Authorization Certificate Application in the block entitled "Authorization Certificate Number" that is located in the top right hand corner of the form. The first two (2) digits in the Authorization Certificate Number must always correspond to the current calendar year followed by a dash with the last two (2) digits corresponding to next number in sequence for the calendar year. The numbering sequence always restarts at the beginning of the new calendar year. For example 11-01, 11-02, 11-03, 11-04..... Assigned staff must ensure that this table is complete with all applicable information or "N/A" is entered, which indicates "Not Applicable." No column can be left blank.
 4. If the mitigation is associated with new construction, assigned staff will apply a certificate of occupancy hold on the project with the notation "Water Quality Buffer Mitigation Required."
 5. Assigned staff will review the application and attachments for completeness within three (3) work days of receipt. If incomplete, staff will issue immediate written notification of the additional information required (see Appendix 28). During this time period, assigned staff will conduct an initial site inspection to verify the existing conditions of the stream and buffer. Existing conditions will be documented with digital photos.
 6. For proposed buffer impacts in the Goose Creek watershed, once a completed application is received a copy will be forwarded via email to the N.C. Division of Water Quality, Mooresville Regional Office for their consideration. Approval of these applications will be done jointly by the Mooresville Regional Office and Charlotte-Mecklenburg Storm Water Services.
 7. If the proposed buffer disturbance exceeds 20,000 square feet and is not associated with a project requiring review by the City Land Development, assigned staff will issue notifications to adjoining property owners within three (3) work days of receipt of a complete application and attachments (see Appendix 29). At the discretion of the Supervisor, written notice can be issued to adjoining property owners for any requested buffer disturbance. Adjoining property owners will have 30 calendar days to comment on the proposed buffer impact. The Water Quality Program Manager has the right to waive this notification requirement as well as increase or decrease the 30 day comment period.
 8. All comments in opposition to the proposed buffer disturbance will be provided to the Supervisor for consideration. The applicant will in good faith consider any comments

from adjacent property owners concerning the proposed buffer impact and the mitigation plan requirements. All comments are to be considered with regard to the water quality impacts associated with the proposed buffer disturbance. They are also to be considered with regard to the finding of “no practical alternative” which is required prior to the approval of any buffer disturbance.

9. Following the 30 day staff review and public comment period, assigned staff will determine approval, approval with modifications or denial of the buffer impact and mitigation. This decision will be based on a finding of “no practical alternative” as described in Section 5.3 and compliance with the mitigation measures contained in Section 5.4 which serve to compensate for the negative water quality impacts associated with the buffer disturbance. If uncertain, assigned staff will consult with the Supervisor who may in turn consult with the Program Manager. In certain situations, water quality modeling may be performed to confirm the effectiveness of the proposed mitigation measure. If the model indicates that the mitigation measure will remove an equal or greater pollutant load than is removed by the undisturbed buffer, then the impact and mitigation will likely be approved.
10. Assigned staff will issue written notification to the applicant regarding approval, approval with modifications or denial of the buffer impact and associated mitigation (see Appendices 30 and 31). The letter must be approved by the Supervisor prior to issuance. A letter indicating approval with modifications must include details regarding the required modifications.
11. If a buffer disturbance is approved, a signed version of the Authorization Certificate Application form, including all attachments, must be returned to the applicant along with the approval letter. This Authorization Certificate will serve as the formal approval document for the buffer disturbance and strict compliance with the information contained in this certificate is required. Failure to comply will result in the immediate revocation of the certificate, which will subject the violator to immediate penalties. To ensure compliance, any variation from the information contained in this certificate must receive approval from Charlotte-Mecklenburg Storm Water Services prior to initiating any buffer disturbance activities.
12. The Authorization Certificate is valid for 12 months following the approval date. The buffer disturbance and all mitigation measures must be completed and approved by Charlotte-Mecklenburg Storm Water Services prior to the end of 12 months or the Authorization Certificate is considered null and void and a new Authorization Certificate Application form will need to be submitted. An extension of the 12 month period is allowed following approval from the Program Manager.
13. If the approved mitigation option is a structural BMP, notification will be issued to the applicant that the Authorization Certificate has been preliminarily approved and that final approval is contingent upon the submittal and approval of construction plans for the BMP (see Appendix 17). These plans must be sealed by a professional engineer and reviewed in accordance with the jurisdiction’s land development policies and post-construction ordinance requirements. The exception is that mitigation for a buffer disturbance on a single family residential lot may use an infiltration BMP and submit a scaled drawing not prepared by a professional engineer (see #1 in Section 5.4.3).
14. If the approved mitigation option is a structural BMP, then a construction bond is required prior to the initiation of buffer disturbance activities and following construction

- a minimum two (2) year maintenance bond is required in accordance with the jurisdiction's land development policies and post-construction ordinance requirements.
15. The applicant is required to notify Charlotte-Mecklenburg Storm Water Services immediately upon the completion of the buffer disturbance and all mitigation activities. Staff will conduct an inspection within three (3) work days of receipt of this notification to ensure compliance with ordinance requirements and the Authorization Certificate. If this notification is not received by the completion date indicated in the Authorization Certificate Application form, staff will automatically conduct a follow up inspection within three (3) work days following this date.
 16. The applicant must provide staff with all the additional documentation and information specified in Section 5.4 for the mitigation option being implemented for the buffer disturbance, included copies of recorded documents, maintenance agreements, etc.
 17. If the inspection reveals noncompliance or if all the required documentation has not been received, a letter will be sent to the applicant notifying them of the necessary corrective actions and setting a deadline for compliance (see Appendix 32).
 18. Once all corrective measures have been completed and verified by a follow up inspection and all additional mitigation information and documentation has been received, the applicant will be issued written notification by staff of the approval of the mitigation activities (see Appendix 33).
 19. Assigned staff will release the certificate of occupancy hold and surety guaranteeing installation (if applicable) on the project immediately following approval of the installation of mitigation measures.
 20. If at any time during the process, the applicant fails to comply with an approved Authorization Certificate or causes damage to surface waters as a result of a buffer impact, the Supervisor is to be immediately notified for consideration of the initiation of the necessary enforcement action.

All buffer disturbances considered for approval by anyone other than Charlotte-Mecklenburg Storm Water Services as indicated in Table 2, including the Zoning Board of Adjustment or Planning Director, will usually require the issuance of a variance by the jurisdiction where the proposed disturbance is located. Contact the Planning Director to obtain the proper forms. Contact information is available on the jurisdiction's website. This document provides no additional information regarding these approvals. Charlotte-Mecklenburg Storm Water Services will become involved in the issuance of these variances only at the request of the jurisdiction.

Section 6 Water Quality Buffer Revegetation Requirements

6.1 Water Quality Buffer Revegetation Levels and Planting Densities

Charlotte-Mecklenburg uses two (2) revegetation methods to mitigate for water quality buffer disturbances, including Level 1 revegetation that involves planting smaller trees at a greater density and Level 2 revegetation that involves larger but fewer trees. Level 1 provides a more cost-effective method of revegetating large buffers, but does not achieve the immediate benefits of Level 2 that are important in more critical buffer areas such as in water supply watersheds and Goose and Six Mile Creeks. Table 3 identifies how these two (2) revegetation levels are applied to different buffer disturbances. The plants to be used for all revegetations are contained in Appendix 15. The two (2) revegetation methods and the other requirements contained in this Section can be altered at the discretion of a Supervisor or the Program Manager when it is determined to be in the best interest of water quality.

Table 3: Revegetation Levels Required for the Type of Buffer Disturbance

Type of Buffer Disturbance	Revegetation Levels	
	Level 1	Level 2
Illegal Buffer Disturbance	Not Allowed	Required
Authorized Disturbance of S.W.I.M. and Post-Construction Buffers	Allowed if >10,000 square feet is disturbed	Allowed
Authorized Disturbance of Water Supply Watershed, Goose Creek and Six Mile Creek Buffers	Not Allowed	Required
Voluntary Buffer Revegetation	Allowed	Allowed

6.1.1 Level 1 Revegetation

Level 1 revegetation allows for denser planting of smaller trees on large sites. As summarized in Table 3 above, Level 1 revegetation is allowed for all voluntary buffer revegetation and for revegetation associated with authorized disturbances of S.W.I.M. and post-construction buffers provided the disturbed area is greater than 10,000 square feet. Level 1 revegetation is not allowed for revegetation associated with illegal buffer disturbances and authorized disturbances of water supply watershed, Goose and Six Mile buffers. The following criteria apply to a Level 1 revegetation.

1. Tree Requirements:
 - 10 trees must be planted for every 1,000 square feet (100 square feet per tree or 436 trees per acre)
 - Trees may be live stakes or dormant cuttings from the previous season’s growth. Live stakes must a minimum of ¾ inch in diameter and 3 feet long. Dormant cuttings must be a minimum of ½ inch in diameter and 2 feet long.
 - 40% to 60% of the trees must be understory species.
 - No greater than 10% of the trees can be pines.
2. Shrub Requirements:
 - 20% of the area to be revegetated can be planted in shrubs instead of trees at a density of 30 shrubs for every 1,000 square feet (33 square feet/shrub or 1,307

- shrubs per acre).
 - Shrubs must be containerized or bare root stock.
 - Shrubs must be planted in groups more densely around the outer edges of the buffer to prevent light penetration and recolonization by invasive species.
3. Groundcover Requirements:
- Achieve 100% groundcover of all exposed soil (no bare areas larger than one square foot) using native seed mixes, grass-like plants, and forbs (from the approved plant list in Appendix 15); or mulch in accordance with the following criteria:
 - When mulch is used as the groundcover option, it must be maintained for a minimum of two (2) years at a minimum depth of two (2) inches. The mulch must be shredded or chipped wood or leaf mould. Sawdust, pine/wheat straw and pine bark cannot be used.
 - Mulch must be maintained around the bases of all trees and shrubs for a minimum five (5) years following planting at a minimum depth of two (2) inches. The mulch must be shredded or chipped wood or leaf mould. Sawdust, pine/wheat straw and pine bark cannot be used.
4. Additional Requirements:
- All trees and shrubs must be maintained in perpetuity and replaced as necessary to ensure that the original planting density is maintained.
 - The use of tree shelters is strongly recommended to protect against deer grazing and mower damage.
 - Erosion within the buffer is strictly prohibited. If mulch is not sufficient to prevent erosion, a vegetative ground cover is required.

6.1.2 Level 2 Revegetation

Level 2 revegetation requires the use of larger plants, which allows a tree canopy to be reestablished more quickly thus affording better water quality protection. As summarized in Table 3 above, Level 2 revegetation is allowed for all buffer disturbances and voluntary buffer revegetation. Level 2 revegetation is required for mitigation of all illegal buffer disturbances as well as for authorized disturbances of water supply watershed, Goose and Six Mile buffers. The following criteria apply to a Level 2 revegetation.

1. Tree Density Requirements:
- 8 trees must be planted for every 1,000 square feet (125 square feet per tree or 348 trees per acre)
 - All trees must be a minimum 1.5 inch caliper measured 6 inches above root ball or 15 gallon containerized.
 - 40% to 60% of trees must be understory species.
 - No pines or other evergreen trees are allowed for use with a Level 2 revegetation.
2. Shrub Density Requirements:
- 10% of the area to be revegetated can be planted in shrubs instead of trees at a density of 30 shrubs for every 1,000 square feet (33 square feet/shrub or 1,307 shrubs per acre).
 - Shrubs must be at least 1 gallon containerized.

- Shrubs must be planted in groups more densely around the outer edges of the buffer to prevent light penetration and recolonization by invasive species.
3. Groundcover Requirements:
- Achieve 100% groundcover of all exposed soil (no bare areas larger than one square foot) using native seed mixes, grass-like plants, and forbs (from the approved plant list in Appendix 15); or mulch in accordance with the following criteria:
 - Vegetative ground cover is preferred over mulch and may be required for steep slopes where erosion is a concern.
 - When mulch is used as the groundcover option, it must be maintained for a minimum of two (2) years at a minimum depth of two (2) inches. The mulch must be shredded or chipped wood or leaf mould. Sawdust, pine/wheat straw and pine bark cannot be used.
 - Mulch must be maintained around the bases of all trees and shrubs for a minimum five (5) years following planting at a minimum depth of two (2) inches. The mulch must be shredded or chipped wood or leaf mould. Sawdust, pine/wheat straw and pine bark cannot be used.
4. Additional Requirements:
- All trees and shrubs must be maintained in perpetuity and replaced as necessary to ensure that the original planting density is maintained.
 - The use of tree shelters is strongly recommended to protect against deer grazing and mower damage.
 - Erosion within the buffer is strictly prohibited. If mulch is not sufficient to prevent erosion, a vegetative ground cover is required.

6.2 Planting Requirements

The following planting requirements will apply to all buffer revegetations:

1. All plants will be native to the North Carolina Piedmont Region. See Appendix 15 for a list of approved plant species for use in a water quality buffer. Plant species not listed in Appendix 15 may be used subject to approval by Charlotte-Mecklenburg Storm Water Services.
2. Invasive species will not be used in any water quality buffer revegetation.
3. For disturbed areas with slopes 3:1 or greater, soil will be stabilized with matting or other approved stabilization method until permanent vegetation is established. Only 100% biodegradable material will be used.
4. Planting allowances may be made for existing trees.
5. It is recommended that chemical fertilizers and pesticides not be used in the buffer due to the risk of storm water pollution. Instead, compost or organic matter should be incorporated into the soil, which will provide sufficient nutrients for adequate plant growth. Invasive species should be removed by hand clearing instead of using pesticides.
6. Plantings should occur at the appropriate time of year to promote survivability. In Mecklenburg County, this is typically from November through early March.

6.3 Species Diversity Requirements

The following species diversity requirements will apply to all buffer revegetations:

1. A minimum of six (6) species of trees will be planted for Water Quality Buffer Revegetation Plans calling for greater than 20 trees.
2. A minimum of three (3) species of shrubs will be planted for Water Quality Buffer Revegetation Plans calling for greater than 15 shrubs.
3. A minimum of two (2) species of grasses or grass-like plants and a minimum of two (2) species of forbs will be planted when these plants are used to establish ground cover in areas greater than 1,000 square feet.

6.4 Water Quality Buffer Revegetation Plan

An Authorization Certificate Application form must be submitted for all buffer revegetations conducted for mitigation of a buffer disturbance. Section 5 includes directions on how to complete this application. In addition, a Water Quality Buffer Revegetation Plan must be submitted along with this application. Both the application and plan must be approved by Charlotte-Mecklenburg Storm Water Services prior to the disturbance of any water quality buffer area. Provided below is the information that must be included in the Water Quality Buffer Revegetation Plan. If the buffer revegetation is to occur on the same parcel as the buffer disturbance, the Water Quality Buffer Revegetation Plan can be incorporated onto the buffer disturbance map developed as part of Section 1 of the Authorization Certificate Application form described in Section 5.2. This can be done by adding numbers 10 through 19 below to this buffer disturbance map, which already includes numbers 1 through 9. An example of a map including the buffer disturbance area and a Water Quality Buffer Revegetation Plan is provided in Appendix 16. If the revegetation is to occur on a separate parcel from the buffer disturbance, include numbers 1 through 9 on a scaled site map of the property where the buffer disturbance is to occur and numbers 10 through 19 on a scaled site map of the property to be revegetated. Both maps must be attached to the Authorization Certificate Application form.

1. Lengths of all boundary/property lines and the parcel's address where the activity and buffer disturbance are proposed.
2. Location of all water course(s) on the property, including all perennial and intermittent streams, lakes, ponds and wetlands.
3. Location(s) of buildings, parking areas, and other impervious surfaces.
4. Location of the buffer area on the parcel, including lengths of all boundary lines and total square footage of the entire buffer and all buffer zones.
5. The scale of the map, which must be smaller than 100 feet to the inch.
6. Date of map.
7. A small scale vicinity map and north arrow.
8. Location of proposed buffer disturbance, including lengths of all boundary lines and total square footage for each buffer zone. The boundary of the disturbed area must include the following: the area of the footprint of the use within the buffer that is causing the impact to the buffer; the area of the boundary of any clearing and grading activities necessary to accommodate the use outside the footprint of the use; and the area of any ongoing maintenance corridors within the stream buffer associated with the use outside the footprint and clearing/grading limits of the use. Temporary equipment access areas are not included in the disturbed area calculation provided tree removal and grading are not required. These access areas must be shown on the map along with a note describing how these areas will be properly stabilized.

9. General location (do not survey), number, size and species of trees greater than two (2) inches in diameter that will be removed from the buffer.
10. Location of the proposed buffer area to be restored, including lengths of all boundary lines and total square footage for each buffer zone.
11. Existing vegetative cover in the proposed restoration area, including the location, number, size and species of trees and other ground cover.
12. Location, number, size, and species of all trees and shrubs to be planted in the restoration area. Specify whether a Level 1 or Level 2 revegetation. All plantings must be of a variety specified in Appendix 15 unless otherwise authorized by Charlotte-Mecklenburg Storm Water Services.
13. Distance between plantings or density of plantings.
14. Type of ground cover to be placed in the restoration area as well as the ground cover to be used to stabilize disturbed areas.
15. The scaled map must contain the following statement: “Following buffer restoration, diffuse flow will be maintained through the buffer in perpetuity.”
16. The scaled map must contain the following statement: “It is recommended that chemical fertilizers and pesticides not be applied in the buffer.”
17. The scaled map must contain the following statement: “All plants will be maintained in perpetuity and will be replaced as necessary to ensure that the original planting density is maintained.”
18. The scaled map must contain the following statement: “Following the complete installation of the approved Water Quality Buffer Revegetation Plan, a final inspection and written approval must be made by Charlotte-Mecklenburg Storm Water Services. Call (704) 336-5456 to schedule a final inspection.”
19. The scaled map must contain the following statement: “It is the responsibility of the property owner to maintain the revegetated site and repair, protect, and add additional controls to protect the buffer as necessary at their sole expense.

Section 7 Variances and Appeals

7.1 Variances

Approval to perform any prohibited buffer disturbance as defined in Section 4 can only be obtained by securing a variance from either the Zoning Board of Adjustment for the jurisdiction with the applicable buffer regulation or the Charlotte-Mecklenburg Storm Water Advisory Committee depending on the buffer type as described in Section 1 and the jurisdiction (see Table 5). There are two (2) exceptions as follows:

1. S.W.I.M. and post-construction buffers in the Towns of Davidson, Huntersville and Matthews require a variance and possible mitigation for any buffer disturbance that is not exempt (see Section 4.3).
2. Goose Creek buffers in the Town of Mint Hill require a variance from Charlotte-Mecklenburg Storm Water Advisory Committee followed by approval from the N.C. Environmental Management Commission (EMC).

Table 4: Appropriate Organization for Granting Variances and Appeals

Buffer Type (see Section 1)	Organization Based on Jurisdiction (1)							
	Charlotte	Cornelius	Davidson	Huntersville	Matthews	Mint Hill	Pineville	Meck. Co.
Watershed	ZBA	ZBA	ZBA	ZBA	N/A	N/A	N/A	N/A
S.W.I.M.	ZBA	ZBA	ZBA	ZBA	ZBA	ZBA	ZBA	ZBA
Post-Construction	SWAC	ZBA	SWAC	ZBA	SWAC	SWAC	SWAC	SWAC
Goose & Six Mile	SWAC	N/A	N/A	N/A	N/A	SWAC/EMC	N/A	N/A

Notes:

- (1) ZBA = Zoning Board of Adjustment
 SWAC = Storm Water Advisory Committee
 EMC = NC Environmental Management Commission
 N/A = This type of buffer does not occur in this jurisdiction.

For a variance to be granted, the applicant must demonstrate that there are practical difficulties or unnecessary hardships that prevent compliance with the strict letter of the buffer protection requirements. Practical difficulties or unnecessary hardships are evaluated in accordance with the following:

1. If the applicant complies with the provisions of the water quality buffer requirements, he/she can secure no reasonable return from, nor make reasonable use of, his/her property. Merely proving that the variance would permit a greater profit from the property is not adequate justification for a variance. Moreover, consideration will be given as to whether the variance is the minimum possible deviation from the terms of the buffer requirements that will make reasonable use of the property possible.
2. The hardship results from the application of the buffer requirements to the property rather than from other factors such as deed restrictions or other hardships.
3. The hardship is due to the physical nature of the applicant's property and is unique to the applicant's property, such as its size, shape, or topography, such that compliance with the provisions of the applicable buffer ordinance would not allow reasonable use of the property.

4. The applicant did not cause the hardship by knowingly or unknowingly violating the buffer requirements.
5. The variance is in harmony with the general purpose and intent of the buffer protection requirements and preserves its spirit; and
6. In granting the variance, the public safety and welfare have been assured, water quality has been protected, and substantial justice has been done.

The process for obtaining a variance is initiated by the submittal of a petition by the owner of the affected property, an agent authorized in writing to act on the owner's behalf, or a person having written contractual interest in the affected property. If the organization responsible for granting the variance is the Zoning Board of Adjustment (see Table 5), then the petition must be submitted to the Zoning Administration for the jurisdiction where the buffer disturbance is proposed. The form to be used and address for submittal can be obtained by contacting the jurisdiction where the proposed buffer impact is located. Contact information can be obtained from the jurisdiction's website under the Planning Department. If the responsible organization is the Storm Water Advisory Committee, then the petition form and instructions for proper submittal can be obtained from the Clerk to the Charlotte-Mecklenburg Storm Water Advisory Committee at 704-336-6171. All petitions for a variance filed with the Storm Water Advisory Committee must be accompanied by a \$100 filing fee along with a list of adjoining properties, including tax parcel numbers and the name and address of each owner.

For variance petitions submitted to Charlotte-Mecklenburg Storm Water Services, the Clerk will transmit copies of all information pertaining to the variance to the nine (9) members of the Committee upon receipt of a variance petition. The Charlotte-Mecklenburg Storm Water Advisory Committee will hold public hearings for all variance petitions in accordance with the rules adopted for such purposes. Prior to the public hearing, written notice will be mailed to the petitioner and surrounding property owners regarding the time, location and subject of the public hearing. The hearing will be conducted in the nature of a quasi-judicial proceeding with all findings of fact supported by competent, material evidence. The Charlotte-Mecklenburg Storm Water Advisory Committee bylaws will determine the number of concurring votes needed to grant a variance. A similar process will be followed for variance petitions submitted to Zoning Board of Adjustment.

7.2 Appeals

Any disagreement regarding any order, decision, or determination relating to the interpretation or application of a water quality buffer ordinance, including assessment of penalties, is resolved through an appeal to either the Zoning Board of Adjustment for the jurisdiction with the applicable buffer regulation or the Charlotte-Mecklenburg Storm Water Advisory Committee, which differs based on the buffer type and jurisdiction as described in Table 5. If the buffer ordinance is part of a jurisdiction's Zoning Ordinance, then decisions regarding the application and administration of the buffer rules are made by the Zoning Administrator for the jurisdiction with assistance from Charlotte-Mecklenburg Storm Water Services and appeals to these decisions are heard by the jurisdiction's Zoning Board of Adjustment. If the buffer ordinance is part of City Code and not the Zoning Ordinance, then decisions regarding the application and administration of the buffer rules are made by Charlotte-Mecklenburg Storm Water Services and



appeals to these decisions are heard by the Charlotte-Mecklenburg Storm Water Advisory Committee. The one exception is that any disagreement over a determination regarding an Authorization Certificate for Goose Creek is referred to the Director of the N.C. Division of Water Quality for a decision. For an appeal to be granted, the Zoning Board of Adjustment or Charlotte-Mecklenburg Storm Water Advisory Committee must find an error in the application of the ordinance by the Zoning Administrator or staff of Charlotte-Mecklenburg Storm Water Services. If the appeal pertains to the assessment of a civil penalty and the Zoning Board of Adjustment or Charlotte-Mecklenburg Storm Water Advisory Committee finds that a violation of the ordinance has occurred, but that in setting the amount of the penalty the appropriate weight was not given to either mitigating or aggravating factors, then they will either decrease or increase the per day civil penalty within the range allowed by the ordinance. If it is determined that a violation has not occurred, then the penalty will be rescinded.

The process for filing an appeal is initiated by the submittal of a notice of appeal by the owner of the affected property, an agent authorized in writing to act on the owner's behalf, or a person having written contractual interest in the affected property. A notice of appeal must be filed within 30 working days of the day the disputed order, decision, determination or interpretation was made. If the organization responsible for granting the appeal is the Zoning Board of Adjustment (see Table 5), then the petition must be submitted to the Zoning Administration for the jurisdiction with the applicable buffer ordinance. The form to be used and address for submittal can be obtained by contacting the jurisdiction where the buffer is located. Contact information can be obtained from the jurisdiction's website under the Planning Department. If the responsible organization is the Charlotte-Mecklenburg Storm Water Advisory Committee, then the petition form and instructions for completion and submittal can be obtained from the Clerk to the Committee at 704-336-6171. All appeals filed with the Charlotte-Mecklenburg Storm Water Advisory Committee must be accompanied by a \$100 filing fee.

Upon receipt of a notice of appeal, Charlotte-Mecklenburg Storm Water Services will transmit to the Storm Water Advisory Committee copies of all administrative papers, records, and other information regarding the subject matter of the appeal. The filing of such notice shall stay any proceedings in furtherance of the contested action, except Charlotte-Mecklenburg Storm Water Services may certify in writing to the Storm Water Advisory Committee that because of facts stated in the certificate, a stay imposes an imminent peril to life or property or would seriously interfere with the enforcement of the Ordinance. The Storm Water Advisory Committee will then review the certificate and may override the stay of further proceedings. The Storm Water Advisory Committee will hold a public hearing on every notice of appeal in accordance with the rules adopted by it for such purposes. Prior to the hearing, the Storm Water Advisory Committee will mail written notice of the time, place and subject of the hearing to the person or persons filing the notice, to the owners of the subject property and to the owners of property adjacent to the subject property. The hearing will be conducted in the nature of a quasi-judicial proceeding with all findings of fact supported by competent, material evidence. The Storm Water Advisory Committee bylaws will determine the number of concurring votes needed to grant an appeal. A similar process will be followed for variance petitions submitted to Zoning Board of Adjustment.



Section 8 Responsibilities for Ensuring Compliance with Buffer Requirements

8.1 Charlotte-Mecklenburg Storm Water Services and Zoning Department

The water supply watershed and S.W.I.M. buffer ordinances for the City of Charlotte and all the Towns are contained in the Zoning Ordinances for the respective jurisdictions; therefore, the responsibility for ensuring compliance lies with the jurisdictions' Zoning Departments and not Charlotte-Mecklenburg Storm Water Services. However, the Zoning Departments in Charlotte-Mecklenburg have granted approval to Charlotte-Mecklenburg Storm Water Services to issue a Corrective Action Request (see Appendices 19 and 20) to the violator notifying them of the violation and the actions necessary to ensure compliance. If the conditions of this Corrective Action Request are not satisfied in the time period indicated, the violation is referred to the appropriate Zoning Department for issuance of a Notice of Violation. If the conditions of this Notice of Violation are not satisfied in the time period indicated, enforcement action, including the assessment of penalties, can be taken by the jurisdiction for violations of their Zoning Ordinance.

The post-construction, Goose Creek and Six Mile Creek buffer requirements are contained in the post-construction ordinances for the City of Charlotte and Towns. The enforcement of the post-construction ordinances, including the buffer requirements, is the responsibility of the Storm Water Administrator as identified in the applicable ordinance. In the City of Charlotte, the Storm Water Administrator is identified as the City Engineer or designee, which includes the staff of Charlotte Storm Water Services. For all the Towns except Cornelius, Mecklenburg County's Water Quality Program Manager has been designated as the Storm Water Administrator. In Cornelius, this title has been assigned to their Planning Director. Therefore, in the City of Charlotte, Notices of Violation and enforcement actions for post-construction and Six Mile Creek buffers are issued by Charlotte Storm Water Services. In the Towns, this task is fulfilled by Mecklenburg County's Water Quality Program Manager, except in Cornelius where the County issues Corrective Action Requests as described above for S.W.I.M. buffer violations followed by a Notice of Violation and possible enforcement action by the Town if compliance is not achieved.

Charlotte Storm Water Services will handle all matters relating to water quality buffers for new construction requiring compliance with post-construction ordinance requirements in the City of Charlotte and its ETJ, including processing Authorization Certificate Applications for buffer disturbances. The one exception is that Mecklenburg County Storm Water Services may comment on water quality buffers for Rezonings. Mecklenburg County Storm Water Services will handle all matters relating to water quality buffers, including processing Authorization Certificate Applications, for existing developments in the City of Charlotte and its ETJ, including additions and expansions that do not involve plan submittal to Charlotte Land Development. In addition, staff with Mecklenburg County Storm Water Services will work with the Towns to ensure compliance with their water quality buffer requirements for both existing development and new construction.

Mecklenburg County Storm Water Services staff will document all authorizations allowing the installation of built-upon area within 30-foot Post-Construction buffer. Staff will document the activity in an Activity report in CityWorks under program element PC-1 and include the exception request, completed Authorization Certificate Application, the decision of the governing body, and final disposition of the request. A summary of these requests will be included as part of the annual reports prepared for the City of Charlotte and the Phase II co-permittees.

Charlotte-Mecklenburg Storm Water Services is also responsible for providing the technical expertise and guidance necessary to ensure compliance with all water quality buffer requirements. Buffer information is maintained on its website at <http://stormwater.charmeck.org> and educational materials have been developed and are distributed to inform the public of the water quality buffer requirements. These materials are available on the website by selecting “Regulations” and then “Buffers & BMPs.” Staff also provides the jurisdictions and citizens with a variety of guidance and information concerning compliance with buffer regulations.

Mecklenburg County Storm Water Services inspects water quality buffers while conducting annual stream walk activities during the winter months. These inspections are concentrated below storm water outfalls. If erosion is observed below an outfall or if other violations of the buffer rules are detected, the Supervisor is notified and corrective actions are initiated immediately. All buffer inspections will be documented along with other stream walk data.

8.2 City and County Land Development

City and County Land Development’s responsibilities for ensuring compliance with water quality buffer requirements are described below.

1. Ensure the proper delineation of water quality buffers on all land development plans.
2. Ensure that temporary sediment basins and other erosion control measures are located outside the buffer except for S.W.I.M. and post-construction buffers where they must be kept out of the stream side zone.
3. Ensure that water quality buffer notations are properly located on land development plans. Land Development staff will conduct random inspections of stream buffers during site development to ensure compliance. These inspections will be conducted as a component of routine erosion control inspection activities.
4. Ensure that stream buffer requirements are properly identified on all commercial site plans (includes everything except single family residences and duplexes).
5. Issue Notices of Violation when a buffer disturbance during development results in noncompliance with approved plans and/or applicable regulations. Zoning will be advised of possible violations of the Zoning Ordinance.
6. Ensure that orange fabric fencing is installed on site along the outer edge of the buffer prior to any land disturbing activities and ensure that all construction activities are performed in compliance with buffer requirements. Sight line cutting for surveying purposes is allowed.
7. Inspect buffer at the completion of construction activities to ensure compliance with all applicable regulations. If violations are detected, take the necessary action to ensure compliance.

8.3 Property Owners

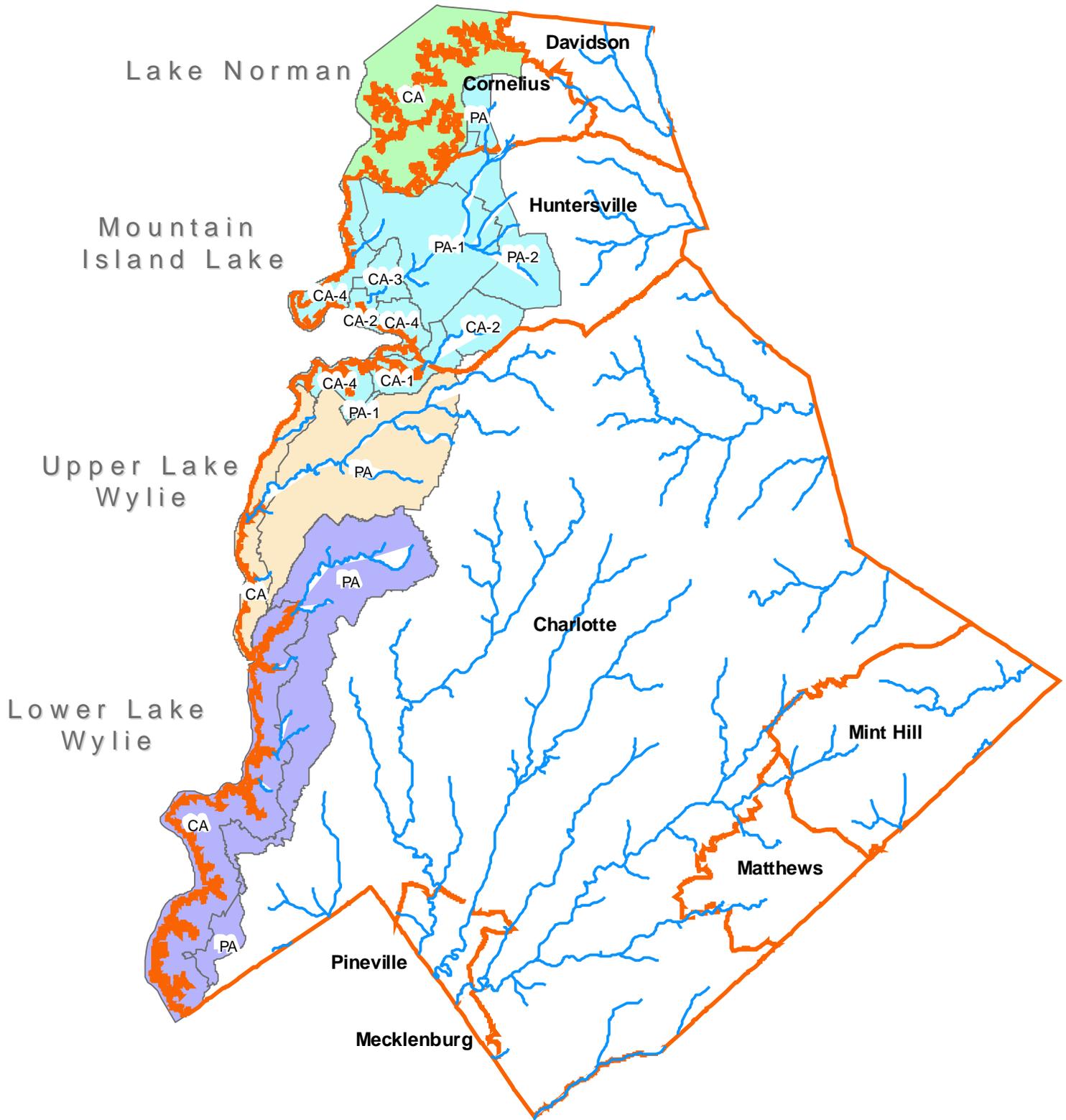
The following are the responsibilities of property owners for ensuring compliance with water quality buffer requirements:

1. Ensure that vegetative cover is maintained within the stream buffer area in compliance with the applicable regulation(s).
2. Ensure that the buffer remains undisturbed except as allowed by the applicable regulations. For example, S.W.I.M. and post-construction buffers allow disturbances in the managed use and upland zones provided vegetative targets are maintained and no fill or impervious area is added to the buffer (see Section 4).
3. If a buffer disturbance is necessary, obtain prior approval from the appropriate agency as described in Section 5.
4. If BMPs are required to be installed as part of an exception request or mitigation, the property owner must ensure the BMPs are maintained in perpetuity to function as designed.
5. Upon the transfer of ownership of property with water quality buffer requirements, ensure that the buffers, including all zones, are clearly identified on record plats, title surveys and deeds. In addition, ensure that the new property owner is fully informed of all stream buffer requirements.
6. If a potential buffer violation is observed, it should be reported by contacting 311.



Appendix 1: Water Supply Watershed Area Map

Water Supply Water Area Map





Appendix 2: Summary of Water Supply Watershed Buffer Requirements

Summary of Water Supply Watershed Buffer Requirements

Lake Norman Watershed

Zone	Zoning Jurisdiction	Built Upon Area	Lake/Stream Buffer
Critical Area (CA)	Davidson	≤ 24% - Low Density ≤ 50% - High Density	40 Feet 100 Feet
Critical Area (CA)	Cornelius	≤ 24% - Low Density ≤ 50% - High Density	50 Feet 100 Feet
Critical Area (CA)	Huntersville	≤ 24% - Low Density ≤ 50% - High Density	50 Feet 100 Feet

Mountain Island Lake Watershed

Zone	Zoning Jurisdiction	Built Upon Area	Lake/Stream Buffer
Protected Area (PA)	Cornelius	≤ 24% - Low Density ≤ 70% - High Density	50 Feet 100 Feet
Protected Area 1 (PA1)	Huntersville	≤ 24% - Low Density ≤ 70% - High Density	50 Feet 100 Feet
Protected Area 1 (PA1)	Charlotte/Mecklenburg	≤ 24% - Low Density ≤ 50% - High Density	50 Feet 100 Feet
Protected Area 2 (PA2)	Huntersville	≤ 24% - Low Density ≤ 70% - High Density	30 Feet 100 Feet
Critical Area 1 (CA1)	Huntersville	≤ 6% - Low Density	100 Feet or 100 yr. Floodplain (whichever is greater)
Critical Area 1 (CA1)	Charlotte/Mecklenburg	≤ 6% - Low Density	100 Feet or 100 yr. Floodplain (whichever is greater)
Critical Area 2 (CA2)	Huntersville	≤ 12% - Low Density	100 Feet or 100 yr. Floodplain (whichever is greater)
Critical Area 3 (CA3)	Huntersville	≤ 12% - Low Density	100 Feet or 100 yr. Floodplain (whichever is greater)
Critical Area 4 (CA4)	Huntersville	≤ 24% - Low Density	100 Feet
Critical Area 4 (CA4)	Charlotte/Mecklenburg	≤ 24% - Low Density	100 Feet or 100 yr. Floodplain (whichever is greater)

Upper Lake Wylie Watershed

Zone	Zoning Jurisdiction	Built Upon Area	Lake/Stream Buffer
Protected Area (PA)	Charlotte/Mecklenburg	≤ 24% - Low Density ≤ 70% - High Density	40 Feet 100 Feet
Critical Area (CA)	Charlotte/Mecklenburg	≤ 24% - Low Density ≤ 50% - High Density	100 Feet 100 Feet

Lower Lake Wylie Watershed

Zone	Zoning Jurisdiction	Built Upon Area	Lake/Stream Buffer
Protected Area (PA)	Charlotte/Mecklenburg	≤ 24% - Low Density ≤ 70% - High Density	40 Feet 100 Feet
Critical Area (CA)	Charlotte/Mecklenburg	≤ 20% - Low Density ≤ 50% - High Density	50 Feet 100 Feet*

* For Lower Lake Wylie Watershed only, buffer width is increased 50% for lots with an average slope greater than or equal to 50%. This applies only to new development proposed along the lake shore, and using the high density option.

General Notes

Drinking Water Supply Watershed Buffers are required along the shorelines of Lake Norman, Mountain Island Lake and Lake Wylie, and along each side of all perennial streams as defined by the United States Geological Survey (USGS).

Drinking Water Supply Watershed Buffers are measured horizontally from the top of the stream bank. Lake buffers are measured horizontally from the full pond elevation of each lake, as follows: Lake Norman – 760 feet, Mountain Island Lake – 648 feet, Lake Wylie – 569.4 feet.

All zoning jurisdictions within Charlotte-Mecklenburg have Surface Water Improvement and Management (S.W.I.M.) and Post Construction stream buffer regulations. If multiple buffers apply to a property, then the most restrictive will govern.

Contacts:

Charlotte/Mecklenburg Zoning– 704/336-3569
 Town of Davidson – 704/892-7591
 Town of Cornelius – 704/896-2461
 Town of Huntersville – 704/875-6541
 Mecklenburg County Water Quality Program – 704/336-5592

Effective Dates:

- Lake Norman
 Mecklenburg County..... June 20, 1994
 Davidson..... October 1, 1993

- Cornelius.....September 20, 1993
- Mountain Island Lake
 - Mecklenburg County.....March 8, 1993
 - Charlotte.....June 21, 1993
 - Cornelius.....September 20, 1993
 - Huntersville.....October 1, 1993
- Upper Lake Wylie
 - Mecklenburg County.....June 20, 1994
 - Charlotte.....June 21, 1993
- Lower Lake Wylie
 - Mecklenburg County.....July 10, 2001
 - Charlotte.....September 17, 2001



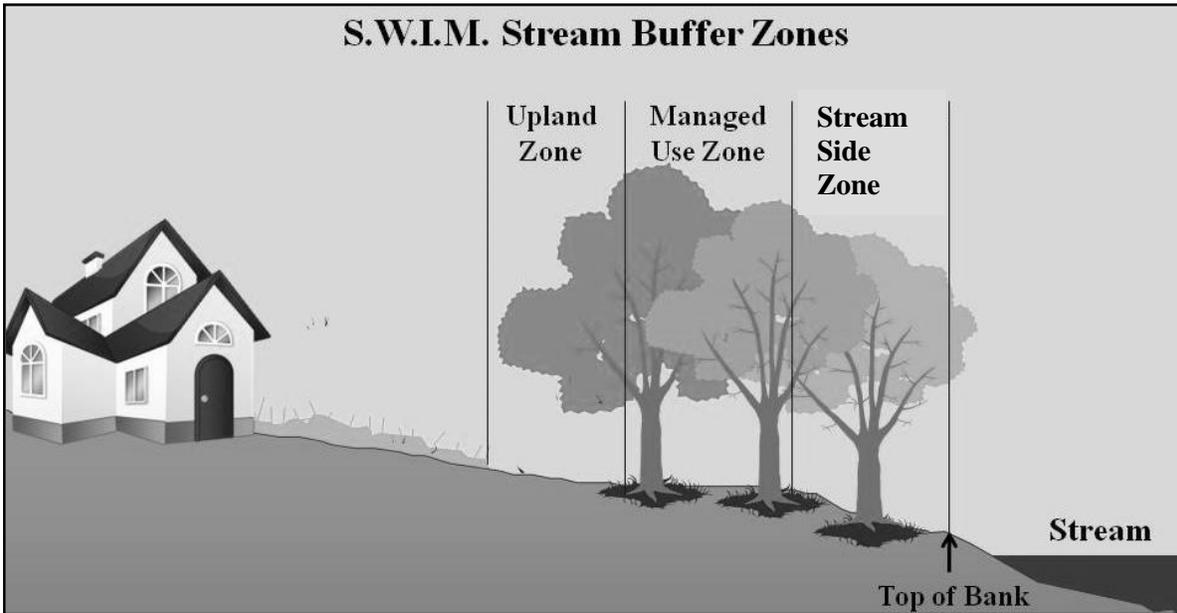
Appendix 3: Summary of S.W.I.M. Buffer Requirements

Summary of S.W.I.M. Buffer Requirements

<i>Jurisdiction (Effective Date)</i>	<i>Total Buffer Widths</i>			
	<i>≥ 640 acres</i>	<i>≥ 300 acres</i>	<i>≥ 100 acres</i>	<i>≥ 50 acres</i>
Mecklenburg County(1) unincorporated (11/9/1999)	total = 100 ft + 50% of area of floodfringe beyond 100 ft stream side=30ft. managed use=45ft. upland=25ft +50% of area of floodfringe beyond 100 ft	total = 50 ft stream side=20ft managed use =20ft. upland=10ft	total = 35 ft stream side=20ft managed use =none upland=15ft	No Buffer Requirements
Charlotte(1) (11/15/1999)	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County
Pineville(1) (4/11/2000)	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County	same as Mecklenburg County
Cornelius(2) (12/6/1999)	total = entire floodplain but no less than 100 feet	total = 50 feet no zones	total = 35 ft no zones	
Huntersville(1) (10/19/1999)	total = floodway + 100% of floodfringe but no less than 100 ft stream side=30ft managed use=45 ft upland=remainder	total = 50 feet stream side=20ft managed use =20ft. upland=10ft	total = 35 ft stream side=20ft managed=none upland=15ft	
Matthews(1) (2/14/2000)	same as Huntersville	same as Huntersville	same as Huntersville	
Mint Hill(1) (7/20/2000)	same as Huntersville	same as Huntersville	same as Huntersville	
Davidson(1) (June 2001)	Total buffer width = a minimum of 100 feet for all streams within Davidson’s jurisdiction. For all FEMA regulated streams the width is 100 feet + 50% of the area of the floodfringe beyond 100 feet – stream side zone = 30 feet, managed use = 45 feet and upland = 25 feet + 50% of area of floodfringe			

Footnotes:

1. Function, vegetative targets and uses for each of the buffer zones correspond to the buffer plan developed by the S.W.I.M. Panel dated April 20, 1999 (as summarized on the following page).
2. No buffer zones have been designated. The entire buffer area is designated in the Ordinance as “UNDISTURBED.”



Buffer function, vegetative targets and use vary according to the different buffer zones as described in the following table.

<i>Characteristics</i>	<i>Stream Side Zone</i>	<i>Managed Use Zone</i>	<i>Upland Zone</i>
Function	Protect the integrity of the ecosystems	Provide distance between upland development and the stream side zone	Prevent encroachment and filter runoff
Vegetative Targets (1)	<u>Undisturbed (no cutting or clearing allowed)</u> - If existing tree density is inadequate, reforestation is encouraged	<u>Limited clearing</u> - Existing tree density must be retained to a minimum of 8 healthy trees of a minimum 6 inch caliper per 1000 square feet - If existing tree density is inadequate, re-forestation is encouraged	<u>Grass</u> or other herbaceous ground cover allowed - Forest is encouraged
Uses (2)	<u>Very restricted</u> - Permitted uses limited to: flood control structures and bank stabilization as well as installation of utilities and road crossings with stabilization of disturbed areas as specified in “III E” above.	<u>Restricted</u> - Permitted uses limited to: all uses allowed in the Stream Side Zone, as well as storm water best management practices (BMPs), bike paths, and greenway trails (not to exceed 10 feet in width)	<u>Restricted</u> - Permitted uses limited to: all uses allowed in the Stream Side and Managed Use Zones, as well as grading for lawns, gardens, and gazebos and storage buildings (non-commercial and not to exceed 150 square feet)

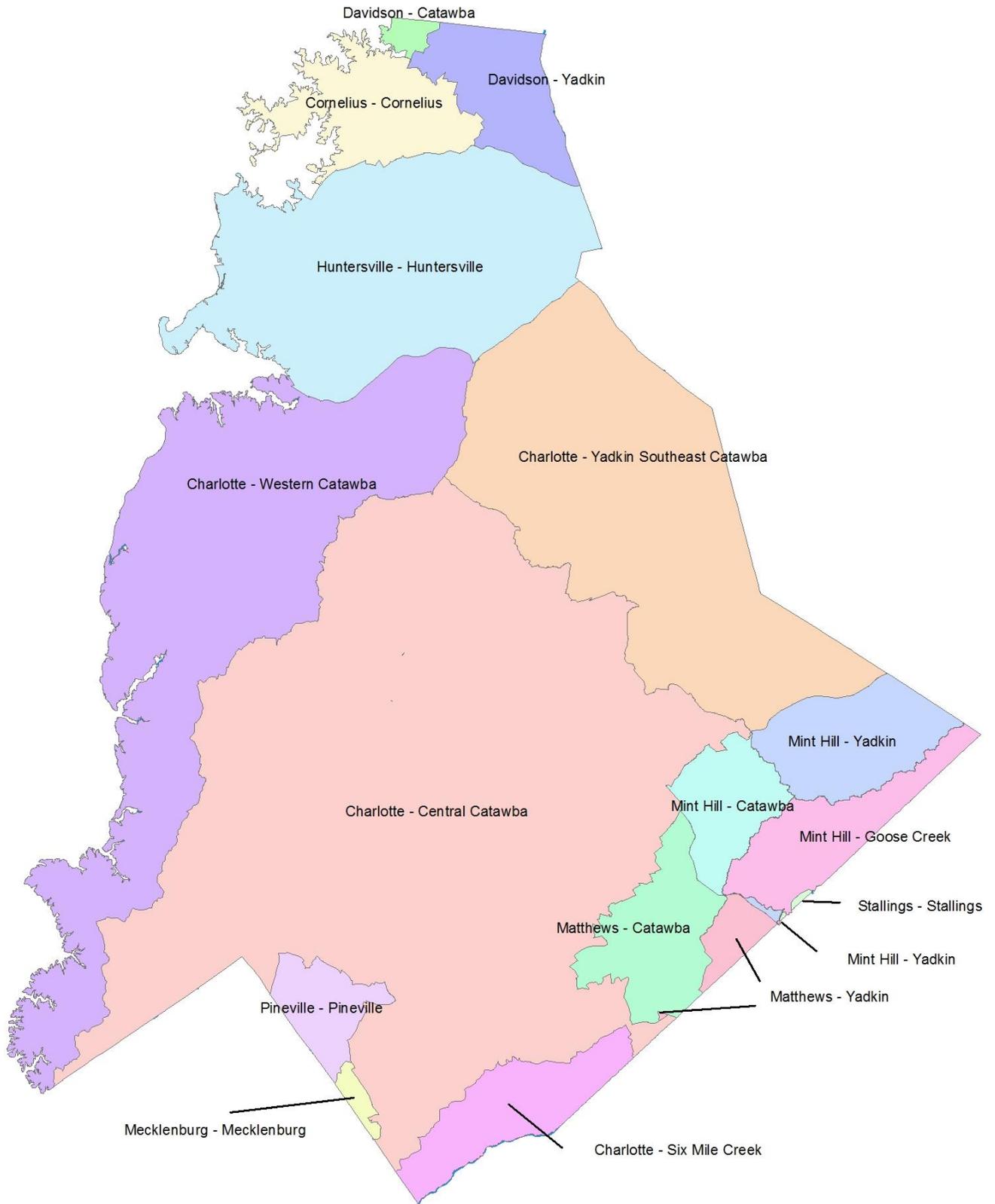
Footnotes:

- (1) Re-vegetation of disturbed buffers is required when such disturbances result in the failure of the buffer system to comply with the vegetative targets specified above.
- (2) Fill material cannot be brought into the buffer. Grading is allowed only in the Upland Zone. Commercial buildings or occupied structures are not allowed in the buffer. Permitted uses within the buffer zones should be coordinated to ensure minimal disturbance of the buffer system. For example, if it is necessary to install utilities within the buffer, every attempt should be made to build greenway trails so they follow the cleared areas instead of requiring additional clearing.



Appendix 4: Post-Construction Ordinance District Map

Post-Construction Ordinance District Map





Appendix 5: Summary of Post-Construction Buffer Requirements

Summary of Post-Construction Buffer Requirements

Jurisdiction	Watershed District	Buffer Width					Buffer Delineation		
		Existing SWIM + 30-ft. no-build zone on <50 acres	50-ft on <50 acres & 100-ft on ≥50 acres for all intermittent & perennial streams	200-ft on perennial & intermittent streams inside the 100-yr floodplain & 100 ft on all other perennial & intermittent streams	100-ft on intermittent & 200-ft. on perennial streams	200-ft on intermittent & perennial streams in FEMA floodplain & 100-ft. on all others	GIS (using POLARIS)	On-Site Delineation (using DWQ methods)	USGS & USDA Maps
City of Charlotte	Central Catawba	X						X	
	Western Catawba	X						X	
	Yadkin-Southeast Catawba		X+ floodplain (undisturbed)					X	
	Six Mile Creek				X (undisturbed)			X	
Cornelius	N/A	X				X			
Davidson	Catawba	X						X	
	Yadkin		X (3 zones)					X	
Huntersville	N/A	X				X			
Matthews	Catawba	X						X	
	Yadkin		X+ floodplain (undisturbed)					X	
Mint Hill	Catawba	X				X			
	Yadkin	X				X			
	Goose Creek			X (undisturbed)				X	
Pineville	N/A	X				X			
Mecklenburg Co.	N/A	X				X			



Appendix 6: Table of Uses for Goose and Six Mile Creeks

Table of Uses for Goose and Six Mile Creeks

Description of Uses	Exempt	Potentially allowable requiring approval (X) / or Potentially allowable requiring both approval and mitigation (X*)	Prohibited
Airport facilities that impact equal to or less than 150 linear feet or one-third of an acre of stream buffer Airport facilities that impact greater than 150 linear feet or one-third of an acre of stream buffer		X X*	
Archaeological activities	X		
Bridges		X	
Dam maintenance activities	X		
Drainage ditches, roadside ditches and storm water outfalls through stream buffers: <ul style="list-style-type: none"> • Existing drainage ditches, roadside ditches, and storm water outfalls provided that they are managed to minimize the sediment, nutrients including ammonia and other pollution that convey to waterbodies • New drainage ditches, roadside ditches and storm water outfalls provided that a storm water management facility is installed to minimize the sediment, nutrients including ammonia and other pollution and attenuate flow before the conveyance discharges through the stream buffer • New drainage ditches, roadside ditches and storm water outfalls that do not minimize the sediment, nutrients including ammonia and other pollution and attenuate flow before discharging through the stream buffer • Excavation of the streambed in order to bring it to the same elevation as the invert of a ditch 	X	X	X X
Drainage of a pond in a natural drainage way provided that a new stream buffer that meets the diffuse flow requirements of Section 306 is established adjacent to the new channel	X		
Driveway crossings of streams and other surface waters subject to this ordinance: <ul style="list-style-type: none"> • Driveway crossings on single family residential lots that disturb equal to or less 	X		

Table of Uses for Goose and Six Mile Creeks

<p>than 25 linear feet in width and are perpendicular³</p> <ul style="list-style-type: none"> • Driveway crossings on single family residential lots that disturb greater than 25 linear feet in width and are perpendicular³ • In a subdivision that cumulatively disturbs equal to or less than 150 linear feet in width and are perpendicular • In a subdivision that cumulatively disturbs greater than 150 linear feet in width and are perpendicular 		<p align="center">X</p> <p align="center">X</p> <p align="center">X*</p>	
Fences provided that disturbance is minimized and installation does not result in removal of forest vegetation	X		
Forest harvesting – see Section 305(C)11			
<p>Fertilizer application:</p> <ul style="list-style-type: none"> • One-time fertilizer application at agronomic rates to establish replanted vegetation • Ongoing fertilizer application 	X		X
Greenway/hiking trails		X	
Historic preservation	X		
Landfills as defined by G.S. 130A-290			X
<p>Mining activities:</p> <ul style="list-style-type: none"> • Mining activities that are covered by the Mining Act provided that new stream buffers that meet the diffuse flow requirements of Section 306 are established adjacent to the relocated channels • Mining activities that are not covered by the Mining Act OR where new stream buffers that meet the diffuse flow requirements of Section 306 are not established adjacent to the relocated channels • Wastewater or mining dewatering wells with approved NPDES permit 		<p align="center">X</p> <p align="center">X*</p>	X
<p>Non-electric utility lines with impacts other than perpendicular crossings³</p> <ul style="list-style-type: none"> • If activity is within 50 feet of the stream • If activity is outside of the inner 50 feet nearest the stream • Wastewater collection system utility lines and lift station lines may impact the stream zone if both gravity and force main collections systems are made of ductile iron and 50% of the collection system is cleaned annually 		<p align="center">X*</p> <p align="center">X</p> <p align="center">X*</p>	

Table of Uses for Goose and Six Mile Creeks

<ul style="list-style-type: none"> Lift Stations require Supervisory Control and Data Acquisition System (SCADA), telemetry, audio and visual alarms, signage with emergency contact, daily visitation (365 days/year), and documentation must be maintained for 3 years of all of the above and available upon request (note: this requirement also applies to collection system perpendicular crossings, detailed below.) 		X*	
<p>Non-electric utility line perpendicular crossing of streams and other surface waters subject to this ordinance that are not collection systems³:</p> <ul style="list-style-type: none"> Perpendicular crossings that disturb equal to or less than 40 linear feet of stream buffer with a maintenance corridor equal to or less than 10 feet in width Perpendicular crossings that disturb equal to or less than 40 linear feet of stream buffer with a maintenance corridor greater than 10 feet in width Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of stream buffer with a maintenance corridor equal to or less than 10 feet in width Perpendicular crossings that disturb greater than 40 linear feet but equal to or less than 150 linear feet of stream buffer with a maintenance corridor greater than 10 feet in width Perpendicular crossings that disturb greater than 150 linear feet of stream buffer <p>Non-electric perpendicular utility line crossings that are collection systems as defined in Rule 15A NCAC 02T .0300 (note: must follow constraints listed under wastewater collection system utility lines and lift stations, above):</p> <ul style="list-style-type: none"> That use any of the following installation methods to minimize the sediment, nutrient and other pollution through the stream buffer: underground directional boring methods, bore-and-jack techniques or another appropriate microtunneling method That does not minimize the sediment, nutrient and other pollution through the stream buffer by the most appropriate exempt method 	X	<p>X</p> <p>X</p> <p>X</p> <p>X*</p> <p>X*</p> <p>X</p>	<p>X</p>
<p>On-site sanitary sewage systems - new ones that use ground absorption</p>			X

Table of Uses for Goose and Six Mile Creeks

Overhead electric utility lines ^{1,2,3} : <ul style="list-style-type: none"> • Stream crossings that disturb equal to or less than 150 linear feet of stream buffer • Stream crossings that disturb greater than 150 linear feet of stream buffer 	X	X*	
Periodic maintenance of modified natural streams such as canals and a grassed travelway on one side of the surface water when alternative forms of maintenance access are not practical		X	
Playground equipment: <ul style="list-style-type: none"> • Playground equipment on single family lots provided that installation and use does not result in removal of vegetation • Playground equipment installed on lands other than single-family lots or that requires removal of vegetation 	X	X	
Ponds in natural drainage ways, excluding dry ponds: <ul style="list-style-type: none"> • New ponds provided that a stream buffer that meets the diffuse flow requirements of Section 306 is established adjacent to the pond • New ponds where a stream buffer that meets the diffuse flow requirements of Section 306 is NOT established adjacent to the pond 		X	X
Protection of existing structures, facilities and stream banks when this requires additional disturbance of the stream buffer or the stream channel		X	
Railroad impacts other than crossings of streams and other surface waters subject to this ordinance			X
Railroad crossings of streams and other surface waters subject to this ordinance: <ul style="list-style-type: none"> • Railroad crossings that impact equal to or less than 40 linear feet of stream buffer • Railroad crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet of stream buffer • Railroad crossings that impact greater than 150 linear feet of stream buffer 	X	X	X
Removal of previous fill or debris provided that diffuse flow is maintained and any vegetation removed is restored	X		
Road impacts other than crossings of streams and other surface waters subject to this ordinance		X*	

Table of Uses for Goose and Six Mile Creeks

<p>Road crossings of streams and other surface waters subject to this ordinance:</p> <ul style="list-style-type: none"> • Road crossings that impact equal to or less than 40 linear feet of stream buffer and is perpendicular • Road crossings that impact greater than 40 linear feet but equal to or less than 150 linear feet and is perpendicular • Road crossings that impact greater than 150 linear feet of stream buffer 	X	X X*	
Scientific studies and stream gauging	X		
<p>Storm water management ponds excluding dry ponds:</p> <ul style="list-style-type: none"> • New storm water management ponds provided that a stream buffer that meets the diffuse flow requirements of Section 306 is established adjacent to the pond • New storm water management ponds where a stream buffer that meets the diffuse flow requirements of Section 306 is NOT established adjacent to the pond 		X	X
Stream restoration	X		
Stream bank stabilization		X	
<p>Temporary roads:</p> <ul style="list-style-type: none"> • Temporary roads that disturb less than or equal to 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads that disturb greater than 2,500 square feet provided that vegetation is restored within six months of initial disturbance • Temporary roads used for bridge construction or replacement provided that restoration activities, such as soil stabilization and revegetation, are conducted immediately after construction 	X	X X	
<p>Temporary sediment and erosion control devices:</p> <ul style="list-style-type: none"> • To control impacts associated with uses approved by the N.C. Division of Water Quality or that have received a variance provided that sediment and erosion control for upland areas is addressed to the maximum extent practical outside the buffer • In-stream temporary erosion and sediment control measures for work within a stream 	X	X	

Table of Uses for Goose and Six Mile Creeks

channel			
Underground electric utility lines: • Impacts other than perpendicular crossings ^{3,4}	X		
Underground electric utility line perpendicular crossings of streams and other surface waters subject to this ordinance: • Perpendicular crossings that disturb less than or equal to 40 linear feet of stream buffer ^{3,4} • Perpendicular crossings that disturb greater than 40 linear feet of stream buffer ^{3,4}	X	X	
Vegetation management: • Emergency fire control measures provided that topography is restored • Planting vegetation to enhance the stream buffer • Pruning forest vegetation provided that the health and function of the forest vegetation is not compromised • Removal of individual trees which are in danger of causing damage to dwellings, other structures or human life • Removal of poison ivy • Removal of understory nuisance vegetation as defined in: Smith, Cherri L. 1998. Exotic Plant Guidelines. Department of Environment and Natural Resources. Division of Parks and Recreation. Raleigh, NC. Guideline #30 (see Appendix 35)	X X X X X X		
Water dependent structures as defined in 15A NCAC 02B .0202		X	
Water wells	X		
Wetland restoration	X		

Footnotes for Above Table

- ^{1.} Provided that all of the following BMPs for overhead utility lines are used. If all of these BMPs are not used, then the overhead utility lines will require a no practical alternatives evaluation by the Storm Water Administrator pursuant to Section 305(C)(1) above.
- A minimum zone of 10 feet wide immediately adjacent to the water body will be managed such that only vegetation that poses a hazard or has the potential to grow tall enough to interfere with the line is removed.
 - Woody vegetation will be cleared by hand. No land grubbing or grading is allowed.
 - Vegetative root systems will be left intact to maintain the integrity of the soil. Stumps will remain where trees are cut.
 - Rip rap will not be used unless it is necessary to stabilize a tower.
 - No fertilizer will be used other than a one-time application to re-establish vegetation.

Table of Uses for Goose and Six Mile Creeks

- Construction activities will minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
 - Active measures will be taken after construction and during routine maintenance to ensure diffuse flow of storm water through the stream buffer.
 - In wetlands, mats will be utilized to minimize soil disturbance.
2. Provided that poles or towers will not be installed within 10 feet of a waterbody unless the Storm Water Administrator completes a no practical alternatives evaluation pursuant to Section 305(C)(1) above.
 3. Perpendicular crossings are those that intersect the surface water at an angle between 75 degrees and 105 degrees.
 4. Provided that all of the following BMPs for underground utility lines are used. If all of these BMPs are not used, then the underground utility line will require a no practical alternatives evaluation by the Storm Water Administrator pursuant to Section 305(C)(1) above.
 - Woody vegetation will be cleared by hand. No land grubbing or grading is allowed.
 - Vegetative root systems will be left intact to maintain the integrity of the soil. Stumps will remain, except in the trench, where trees are cut.
 - Underground cables will be installed by vibratory plow or trenching.
 - The trench will be backfilled with the excavated soil material immediately following cable installation.
 - No fertilizer will be used other than a one-time application to re-establish vegetation.
 - Construction activities will minimize the removal of woody vegetation, the extent of the disturbed area, and the time in which areas remain in a disturbed state.
 - Active measures will be taken after construction and during routine maintenance to ensure diffuse flow of storm water through the stream buffer.
 - In wetlands, mats will be utilized to minimize soil disturbance.



Appendix 7: Summary of Exemptions from Water Quality Buffer Requirements

Summary of Exemptions from Water Quality Buffer Requirements

The table below provides a list of the exemptions from the buffer requirements in Charlotte-Mecklenburg based on the jurisdiction and buffer type. The exemption types are indicated in the rows and the jurisdictions in the columns. The buffer types are represented in the key below. If a keyed buffer type appears under a jurisdiction for a particular exemption, then if that exemption is met for a parcel in that jurisdiction then that buffer type will not apply. For all jurisdictions, if more than one buffer type is required, the buffer that is more protective of water quality will always apply. This document only presents a summary of the buffer exemptions. For more detailed information, refer to the specific ordinance.

Key:

Water Supply Watershed Buffers = W

S.W.I.M. Buffers = S

Post-Construction Buffers = P (includes Goose and Six Mile Creek Buffers)

Exemption	Charlotte	Cornelius	Davidson	Huntersville	Matthews	Mint Hill	Pineville	Goose Cr.	County
Existing development (1)(2)(4)	W		W	W					
Expansions to uses classified as existing development for single-family residential only			W						
Certificate of compliance issued (2)	S(7), P	S, P	S, P	S(7), P	P	S(7), P	S(7), P		S(7), P
Valid building permit issued (2)	S(7), P	P	P	S(7), P	P	S(7), P	S(7), P		S(7), P
Vested rights established (2)(3)	W, S(7), P	W, P	W, P	W, S(7)	S(7), P	S(7), P	S(7), P		S(7), P
Existing lot (2)(5)			W (SF only)	W					
Expansion of existing utilities (2)	W (with exceptions)			W (public utilities with exceptions)					
Reconstruction of bldgs. or built-upon-area (2)		W							
Have been subdivided by a recorded subdivision plat (2)	S(7)			S(7)	S(7)	S(7)	S(7)		S(7)
Have been described by metes and bounds in a recorded deed (2)(6)	S(7)			S(7)		S(7)	S(7)		S(7)
Are included on a valid preliminary subdivision plan (2)	S(7)			S(7), P (or sketch plan)	S(7)	S(7)	S(7)		S(7)
Piped sections of a stream	S	S	S	S	S	S	S		S
For residential development and redevelopment, preliminary subdivision plan application or in the case of minor subdivisions, construction plan for required improvements, submitted and accepted for review (2)	P				P (does not include redevelopment)	P (does not include redevelopment)	P (does not include redevelopment)		P (does not include redevelopment)
For nonresidential development and redevelopment, preliminary subdivision plan application submitted and accepted for review, provided that subdivision-wide water quality and quantity features required at the time of submittal	P				P (does not include redevelopment)	P (does not include redevelopment)	P (does not include redevelopment)		P (does not include redevelopment)

Exemption	Charlotte	Cornelius	Davidson	Huntersville	Matthews	Mint Hill	Pineville	Goose Cr.	County
are contained within the submittal and provided the plan is subsequently approved and all easements are properly established (2)									
Zoning use application submitted and accepted for review for uses that do not require a building permit (2)	P	P	P	P		P	P		P
Conditional zoning district apprvd (2)	P		P	P (conditional rezoning app. submitted by May 1, 2007)	P	P	P		P
Residential development that cumulatively disturbs less than one acre and cumulatively creates less than 24% built upon area based on lot size or the lot is less than 20,000 square feet (lot must have been described by metes and bounds in a recorded deed and cannot be part of a larger development or redevelopment)	P		P		P		P		P
Commercial and industrial development that cumulatively disturbs less than one acre and cumulatively creates less than 20,000 square feet of built upon area (built upon area includes gravel and other partially impervious materials)	P		P		P		P		P
Redevelopment that disturbs less than 20,000 square feet, is not part of a larger development, does not decrease existing storm water controls and renovation and/or construction costs (excluding trade fixtures) do not exceed 100% of the tax value of the property	P		P	P (for non-single family homes only)			P		P
Activities exempt from permit requirements of Section 404 of the federal Clean Water Act, as specified in 40 CFR 232 (primarily, ongoing farming and forestry activities)	P	P	P		P	P	P		P
Major site plans, major subdivision and conditional use plans submitted and accepted for review (2)		P							
Development that cumulative disturbs less than one acre and is not part of a larger plan of development or sale		P		P (new development, redevelopment & expansions)		P			
Redevelopment or expansion that cumulatively disturbs less than one acre and is not part of a		P				P			

Exemption	Charlotte	Cornelius	Davidson	Huntersville	Matthews	Mint Hill	Pineville	Goose Cr.	County
larger plan of development or sale									
Master plan approved			P						
Redevelopment of transit station areas, distressed business districts, brownfields and conditional planning areas approved by the Town Board provided there is no net increase in built upon area and storm water control is greater than or equal to previous development			P						
Redevelopment or expansions that result in no net increase in built-upon area and provide equal or greater storm water control than the previous development		P			P	P			
Redevelopment that cumulatively disturbs less than 20,000 square feet and is not part of a larger plan of development or sale					P				
Residential development activity that disturbs less than one acre of land and is not part of a larger common plan of development or sale, including new development, redevelopment or expansions, is not subject to the provisions of this regulation			P						
Non-residential development activity that disturbs less than ½ acre of land and is not part of a larger common plan of development or sale, including new development, redevelopment or expansions			P						
Development and redevelopment projects within transit station areas designated by the Planning Director based on Corridor Record of Decisions or distressed business districts designated by the Economic Development Director are allowed by right to forego meeting the requirements of this ordinance, except for peak control and downstream analysis requirements (specific provisions have to be met)	P								
Use is existing and ongoing (9)		W						P	
Project requires a 401 Certification/ 404 Permit		W							
Redevelopment is allowed for residential and non-residential structures provided that less than an additional half acre is disturbed during the redevelopment for non-residential structures								P	

Appendix 7: Summary of Exemptions from Water Quality Buffer Requirements
Footnotes

(1) Existing development means projects that are built or projects that at a minimum have established a vested right under N.C. zoning law as of the effective date of the ordinance as described in (2) and (3) below.

(2) As of the effective date of the ordinance as indicated below:

Water Supply Watershed

- Lake Norman
 - Mecklenburg County..... June 20, 1994
 - Davidson..... October 1, 1993
 - Cornelius..... September 20, 1993
- Mountain Island Lake
 - Mecklenburg County..... March 8, 1993
 - Charlotte..... June 21, 1993
 - Cornelius..... September 20, 1993
 - Huntersville..... October 1, 1993
- Upper Lake Wylie
 - Mecklenburg County..... June 20, 1994
 - Charlotte..... June 21, 1993
- Lower Lake Wylie
 - Mecklenburg County..... July 10, 2001
 - Charlotte..... September 17, 2001

S.W.I.M.

- Charlotte..... November 15, 1999
- Cornelius..... December 6, 1999
- Davidson..... June 2001
- Huntersville..... October 19, 1999
- Matthews..... February 14, 2000
- Mint Hill..... July 20, 2000
- Pineville..... April 11, 2000
- Mecklenburg County..... November 9, 1999

Post-Construction

- County & Towns..... June 30, 2007
- City of Charlotte..... July 1, 2008

Goose Creek

- Mint Hill..... February 1, 2009

(3) Vested rights are established under N.C. law if at least one of the following are met except for the Town of Huntersville, which has significantly different criteria that will require a review of their specific Zoning Ordinance under Article 2, Section 2.2:

- Substantial expenditure of resources (time, labor, money) based on a good faith reliance upon having received a valid local government approval to proceed with the project; or
- Having an outstanding valid building permit; or
- Having an approved site specific or phased development plan.

- (4) Expansion to structures classified as existing development must meet the buffer requirements.
- (5) An existing lot is defined as a lot which is part of a subdivision, a plat of which has been recorded in the office of the register of deeds prior to the adoption of this ordinance, or a lot described by metes and bounds, the description of which has been so recorded prior to the adoption of the ordinance.
- (6) Have been described by metes and bounds in a recorded deed which:
 - If to be used for residential purposes:
Are 1 acre or less in size.
 - If to be used for nonresidential purposes:
Are 4 acres or less in size if located on a non-FEMA regulated floodway, or
Are 7 acres or less in size if located on a FEMA regulated floodway.
- (7) Redevelopment or expansions to uses included in this category are not subject to S.W.I.M. buffer requirements unless it would result in an increase in the total impervious area within the buffer.
- (8) S.W.I.M. Buffer requirements do not apply to the shoreline of the Catawba River lakes
- (9) Only the portion of the buffer that contains the footprint of the existing and ongoing use is exempt. Activities necessary to maintain uses are allowed provided that the site remains similarly vegetated, no impervious surface is added within the buffer area where it did not exist as of February 1, 2009 and existing diffuse flow is maintained. In the Town of Cornelius, this is expanded to allow existing development to continue and be maintained provided that no additional disturbance occurs in the buffer.



Appendix 8: Stream Reach Evaluation Form

Stream Reach Evaluation Form

Date:		Evaluator:		Easting:	
Project:				Northing:	
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ (right-click the purple number and left-click Update Field to summarize points)					0.0

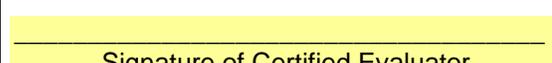
A. Geomorphology	Absent	Weak	Moderate	Strong	SCORE
1 ^a . Continuity of channel bed and bank	0	1	2	3	
2. Sinuosity of channel along thalweg	0	1	2	3	
3. In-channel structure: riffle- / step- pool sequence	0	1	2	3	
4. Particle size of stream substrate	0	1	2	3	
5. Active/relic floodplain	0	1	2	3	
6. Depositional bars or benches	0	1	2	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	1	2	3	
9. Grade controls	0	0.5	1	1.5	
10. Natural valley	0	0.5	1	1.5	
11. Second or greater order channel	No = 0		Yes = 3		
Geomorphology Subtotal					0.0

^a Man-made ditches are not rated: see discussion in NCDWQ Manual

B. Hydrology	Absent	Weak	Moderate	Strong	SCORE
12. Presence of Baseflow	0	1	2	3	
13. Iron Oxidizing Bacteria	0	1	2	3	
14. Leaf litter	1.5	1	0.5	0	
15. Sediment on plants or debris	0	0.5	1	1.5	
16. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5	
17. Soil-based Evidence of high water table?	No = 0		Yes = 3		
Hydrology Subtotal					0.0

C. Biology	Absent	Weak	Moderate	Strong	SCORE
18. Fibrous roots in streambed	3	2	1	0	
19. Rooted upland plants in streambed	3	2	1	0	
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	
21. Aquatic Mollusks	0	1	2	3	
22. Fish	0	0.5	1	1.5	
23. Crayfish	0	0.5	1	1.5	
24. Amphibians	0	0.5	1	1.5	
25. Algae	0	0.5	1	1.5	
26. Wetland plants in streambed	FACW= 0.75, OBL= 1.5, Other= 0				
Biology Subtotal					0.0

* perennial streams may also be identified using other methods. See page 35 of NCDWQ manual.

Notes:	
I certify that this evaluation conforms to the latest version of the NCDWQ document entitled <u>Methodology for Identification of Intermittent and Perennial Streams and their Origins.</u>	 Signature of Certified Evaluator

(version 4.11)



Appendix 9: Stream Reach Exemption Disapproval Form



700 North Tryon Street
Charlotte, NC 28202
Fax: 704.336.4391

<DATE>

<ADDRESS>

Re: <PROJECT NAME>
Disapproval of Request for Stream Exemption
<PROJECT LOCATION>
<JURISDICTION NAME>

Dear <NAME>:

Please be advised that the Request for Stream Exemption that you submitted for <PROJECT NAME> has been disapproved by this Office based on staff's performance of an on-site evaluation using the North Carolina Division of Water Quality (NCDWQ) methodology for stream identification (see attached form). This stream reach will be subject to the applicable post-construction buffer requirements when development or redevelopment activities occur on the property.

<INSERT THE FOLLOWING SENTENCE IF IN THE TOWNS> The Planning Department for the <TOWN NAME> is being notified of this disapproval by copy of this letter.

If you have any questions or want to discuss the evaluation, please call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>
Charlotte-Mecklenburg Storm Water Services

Attachments: Stream Reach Aerial Photograph
Stream Reach Evaluation Form

CC: <TOWN PLANNER'S NAME>, <TITLE>



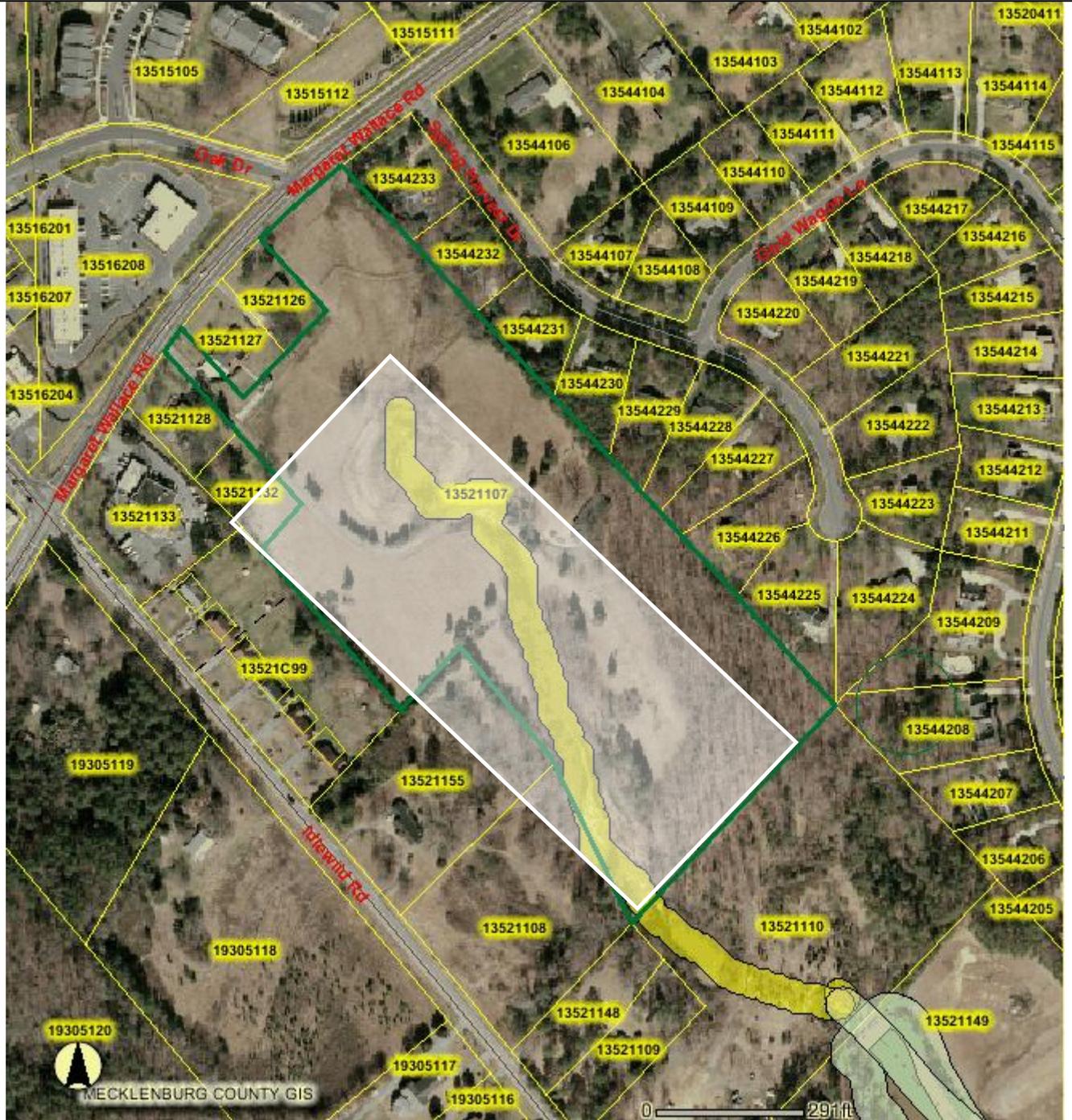
To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>



Stream Reach Aerial Photograph

Project Name: Example

Project Location: 101 Smith Street



LEGEND:



= Stream reach evaluated for the Post Construction buffer requirements

Stream Reach Evaluation Form

Date:		Evaluator:		Easting:	
Project:				Northing:	
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ (right-click the purple number and left-click Update Field to summarize points)					0.0

A. Geomorphology	Absent	Weak	Moderate	Strong	SCORE
1 ^a . Continuity of channel bed and bank	0	1	2	3	
2. Sinuosity of channel along thalweg	0	1	2	3	
3. In-channel structure: riffle- / step- pool sequence	0	1	2	3	
4. Particle size of stream substrate	0	1	2	3	
5. Active/relic floodplain	0	1	2	3	
6. Depositional bars or benches	0	1	2	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	1	2	3	
9. Grade controls	0	0.5	1	1.5	
10. Natural valley	0	0.5	1	1.5	
11. Second or greater order channel	No = 0		Yes = 3		
Geomorphology Subtotal					0.0

^a Man-made ditches are not rated: see discussion in NCDWQ Manual

B. Hydrology	Absent	Weak	Moderate	Strong	SCORE
12. Presence of Baseflow	0	1	2	3	
13. Iron Oxidizing Bacteria	0	1	2	3	
14. Leaf litter	1.5	1	0.5	0	
15. Sediment on plants or debris	0	0.5	1	1.5	
16. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5	
17. Soil-based Evidence of high water table?	No = 0		Yes = 3		
Hydrology Subtotal					0.0

C. Biology	Absent	Weak	Moderate	Strong	SCORE
18. Fibrous roots in streambed	3	2	1	0	
19. Rooted upland plants in streambed	3	2	1	0	
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	
21. Aquatic Mollusks	0	1	2	3	
22. Fish	0	0.5	1	1.5	
23. Crayfish	0	0.5	1	1.5	
24. Amphibians	0	0.5	1	1.5	
25. Algae	0	0.5	1	1.5	
26. Wetland plants in streambed	FACW= 0.75, OBL= 1.5, Other= 0				
Biology Subtotal					0.0

* perennial streams may also be identified using other methods. See page 35 of NCDWQ manual.

Notes:		
I certify that this evaluation conforms to the latest version of the NCDWQ document entitled <u>Methodology for Identification of Intermittent and Perennial Streams and their Origins.</u>	 Signature of Certified Evaluator	

(version 4.11)



Appendix 10: Stream Reach Exemption Approval Form

<DATE>

<ADDRESS>

Re: <PROJECT NAME>
Approval of Request for Stream Exemption
<PROJECT LOCATION>
<JURISDICTION NAME>

Dear <NAME>:

Please be advised that the Request for Stream Exemption that you submitted for <PROJECT NAME> has been approved by this Office based on staff's performance of on-site evaluation using the North Carolina Division of Water Quality (NCDWQ) methodology for stream identification. The stream reach to which this exemption applies is shown on the attached aerial photograph. This stream reach will not be subject to the buffer requirements of the post-construction ordinance. Please note that this letter does not exempt the stream reach from compliance with other local, state, or federal ordinances involving jurisdictional stream / wetland requirements, such as Section 401 and 404 of the Clean Water Act.

<INSERT THE FOLLOWING PARAGRAPH IF IN THE TOWNS>This approval is required prior to the approval of your Concept Plan for this project and prior to your submittal of the Storm Water Management Permit Application. Please be sure to attach a copy of this approval letter to your Concept Plan Application and Storm Water Management Permit Application to avoid a delay in application review.

<INSERT THE FOLLOWING PARAGRAPH IF IN THE TOWNS>The Planning Department for the <TOWN NAME> is being notified of this disapproval by copy of this letter.

If you have any questions or want to discuss the evaluation, please call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services

Attachments: Stream Reach Aerial Photograph & Stream Reach Evaluation Form

CC: <TOWN PLANNER'S NAME>, <TITLE>
David Kroening, CMSWS



CHARLOTTE

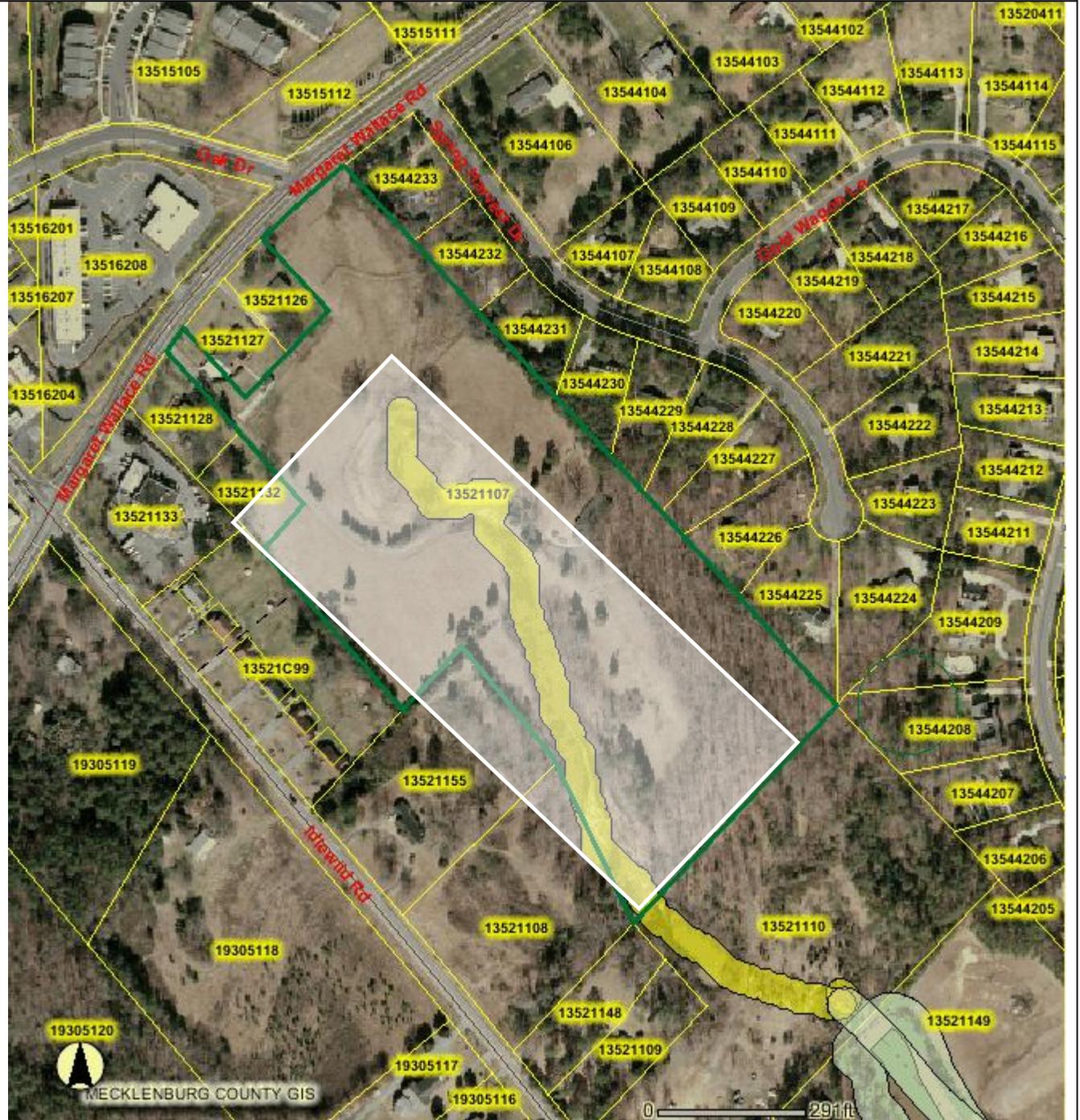
To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>



Stream Reach Aerial Photograph

Project Name: [Example](#)

Project Location: [101 Smith Street](#)



LEGEND:



= Stream reach exempt from the Post Construction buffer requirements



Stream Reach Evaluation Form

Date:		Evaluator:		Easting:	
Project:				Northing:	
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ (right-click the purple number and left-click Update Field to summarize points)					0.0

A. Geomorphology	Absent	Weak	Moderate	Strong	SCORE
1 ^a . Continuity of channel bed and bank	0	1	2	3	
2. Sinuosity of channel along thalweg	0	1	2	3	
3. In-channel structure: riffle- / step- pool sequence	0	1	2	3	
4. Particle size of stream substrate	0	1	2	3	
5. Active/relic floodplain	0	1	2	3	
6. Depositional bars or benches	0	1	2	3	
7. Recent alluvial deposits	0	1	2	3	
8. Headcuts	0	1	2	3	
9. Grade controls	0	0.5	1	1.5	
10. Natural valley	0	0.5	1	1.5	
11. Second or greater order channel	No = 0		Yes = 3		
Geomorphology Subtotal					0.0

^a Man-made ditches are not rated: see discussion in NCDWQ Manual

B. Hydrology	Absent	Weak	Moderate	Strong	SCORE
12. Presence of Baseflow	0	1	2	3	
13. Iron Oxidizing Bacteria	0	1	2	3	
14. Leaf litter	1.5	1	0.5	0	
15. Sediment on plants or debris	0	0.5	1	1.5	
16. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5	
17. Soil-based Evidence of high water table?	No = 0		Yes = 3		
Hydrology Subtotal					0.0

C. Biology	Absent	Weak	Moderate	Strong	SCORE
18. Fibrous roots in streambed	3	2	1	0	
19. Rooted upland plants in streambed	3	2	1	0	
20. Macroinvertebrates (note diversity and abundance)	0	1	2	3	
21. Aquatic Mollusks	0	1	2	3	
22. Fish	0	0.5	1	1.5	
23. Crayfish	0	0.5	1	1.5	
24. Amphibians	0	0.5	1	1.5	
25. Algae	0	0.5	1	1.5	
26. Wetland plants in streambed	FACW= 0.75, OBL= 1.5, Other= 0				
Biology Subtotal					0.0

* perennial streams may also be identified using other methods. See page 35 of NCDWQ manual.

Notes:		
I certify that this evaluation conforms to the latest version of the NCDWQ document entitled <u>Methodology for Identification of Intermittent and Perennial Streams and their Origins.</u>	_____ Signature of Certified Evaluator	

(version 4.11)



Appendix 11: Water Quality Buffer Plan Review Check Sheet

Water Quality Buffer Plan Review Check Sheet

Subdivision Name: _____

Tax Parcel #: _____

Date of Review: _____

Reviewed by: _____

Reviewed for: _____

Buffer Widths:

_____ Buffer widths on the plan are correct based off Internet coverage (<http://polaris.mecklenburgcountync.gov/website/redesign/viewer.htm> - select "WATER QUALITY") and are measured horizontally on a line perpendicular to the surface water, landward from the top of the bank on each side of the stream.

Water Quality Buffer Delineation:

- _____ Buffer areas are clearly identified on plans in bold, clear type as "WATER QUALITY BUFFER."
- _____ The outside boundary of each buffer zone is clearly marked on plans.
- _____ The top of the bank from where the buffer width is measured is clearly labeled on plans.
- _____ The outside boundary of the buffer is permanently marked with an iron pin or other acceptable property corner marker at all street crossings and this iron is called out on plans.
- _____ The outside boundary of the buffer is delineated with orange fabric fencing prior to land disturbing activities and this fencing is called out on plans.
- _____ Streams and buffer boundaries including the delineation of each zone and a dimension from a specific location are shown on all surveys and record plats, including individual record plats for any lots affected.

Vegetative Targets:

- _____ Plans clearly indicate that the stream side zone is to be left "undisturbed."
- _____ Plans clearly indicate that a limited number of trees (or none at all) can be removed from the managed use zone. Some trees can be removed provide that the tree density remaining is a minimum of 8 healthy trees of a minimum 6 inch caliper per 1000 square feet. Removal of existing vegetation must be performed in such a manner as to prevent damage to the roots of remaining trees.
- _____ Plans clearly indicate that if grading is performed in the upland zone, it must be performed in such a manner as to prevent damage to the roots of remaining trees. Grass or other suitable ground cover can be applied to the upland zone.
- _____ Plans clearly indicate that no fill material is to be brought into the buffer and that no structures are allowed within any of the buffer areas (except non-commercial out buildings not exceeding 150 square feet).
- _____ Plans indicate plantings below storm water outfalls to prevent erosion.
- _____ Activities in the buffer comply with the applicable Zoning Ordinance.

Storm Water Outfalls:

- _____ All storm water outfalls are shown on plans.
- _____ Plans indicate that all storm water outfalls end prior to the outer edge of the buffer.
- _____ Engineered channels and piped storm water flow are NOT shown in the buffer.
- _____ Plans indicate that approved energy dissipators are located at the end of all storm water outfalls outside of the buffer.
- _____ Plans provide “details” for energy dissipators.

Erosion Control Devices:

- _____ Erosion control measures are adequate to protect the buffer.
- _____ The locations of temporary sediment basins are clearly shown on plans.
- _____ All temporary sediment basins and other erosion control devices are located outside the buffer.

Required Plan Notations:

- _____ The stream side zone of the buffer must be left completely undisturbed. In the managed use zone, a limited number of trees can be removed provided that the tree density remaining is a minimum of 8 healthy trees of a minimum 6 inch caliper per 1000 square feet. Removal of existing vegetation must be performed in such a manner as to prevent damage to the roots of remaining trees. No fill material can be brought into the buffer.
- _____ Grading and other land disturbing activities are allowed only in the upland zone; however, these activities must be performed in such a manner as to prevent damage to the roots of remaining trees. Grass or other suitable ground cover can be applied to the upland zone.
- _____ The outside buffer boundary must be clearly marked by orange fabric fencing prior to any land disturbing activities at the site and this fencing must be called out on the plans.
- _____ The outside boundary of the stream buffer must be permanently marked with an iron pin or other acceptable property corner marker at street crossings and this marker must be called out on plans.

Notes:



Appendix 12: Pathway Guidelines for Water Supply Watershed Buffers

Pathway Guidelines for Water Supply Watershed Buffers

Pedestrian pathways are allowed through the buffer to provide access to the water or to a pier, provided they are pre-approved by Charlotte-Mecklenburg Storm Water Services. Pathways should meander through the buffer avoiding trees and minimizing environmental impact.

Openings for pathways should not exceed four (4) feet in width and only one (1) pathway is allowed per residential lot. Pathways should take the most direct route from the house to the water or pier to minimize disturbance. Pathways must be made of pervious materials such as mulch or sand. Pathways made of concrete, asphalt, pavers, rock or gravel are not allowed in buffer. Slatted boardwalks are allowed, provided the following guidelines are adhered to:

Boardwalk:

1. Boardwalks are allowed but spaces must be at least 1/4 inch apart between boards. The ground beneath the boardwalk must be comprised of pervious material.
2. No trees can be cut or damaged during installation.
3. Width may be no more than 3 feet at any location.



Appendix 13: Irrigation System Guidelines for Water Supply Watershed Buffers

Water Supply Watershed Irrigation System Guidelines

1. Homeowners will notify Charlotte-Mecklenburg Storm Water Services in writing of their intent to install an irrigation system through a buffer. An Authorization Certificate Application form (see Appendix 14) must be submitted.
2. No trees larger than two (2) inches in diameter can be cut from the buffer.
3. No heavy mechanical equipment such as trenchers may be used in the buffer. Only hand clearing and hand digging tools are allowed.
4. No fuel powered pumps are allowed in the buffer. Small electrical pumps are permitted.
5. No impervious pads (concrete, asphalt, etc.) are permitted in the buffer. Wooden frames may be placed around pumps for support.
6. All irrigation lines must be installed in such a way as to prevent the back flow of water to the lake. The use of back flow prevention and foot valves is recommended.
7. Irrigation lines installed through the buffer must disturb as little area as possible.
8. Erosion control devices such as high hazard silt fence must be installed and maintained if the ground is disturbed longer than 24 hours, or if rain is predicted at any time during construction.
9. After installation, the disturbed area must be stabilized with a vegetative groundcover or covered with mulch or pine straw.



Appendix 14: Authorization Certificate Application for a Water Quality Buffer Disturbance



Authorization Certificate Application for a Water Quality Buffer Disturbance

FOR OFFICE USE ONLY: Application Received
 Date: _____ Time: _____ Complete Submittal Yes No

FOR OFFICE USE ONLY: Authorization
 Certificate Number: _____

Instructions for the proper completion of this form are available on the following website: <http://stormwater.charmeck.org>
 (Select “Regulations”, select “Buffers & BMPs”, select “Water Quality Buffer Implementation Guidelines” see Section 5).

SECTION 1: GENERAL INFORMATION

Applicant’s Name:	
Applicant’s Mailing Address:	
Applicant’s Phone Numbers: Office	Cell
Applicant’s Email:	
Owner’s Name (if different from above applicant):	
Owner’s Address:	
Owner’s Phone: Office	Cell
Owner’s Email:	
If applicant is different from owner, describe affiliation and attach to this application written authorization for the buffer disturbance signed by the property owner:	
Contractor’s Name (or name of other parties involved in buffer disturbance and/or mitigation if applicable):	
Contractor’s Mailing Address:	
Contractor’s Phone Numbers: Office	Cell
Contractor’s Email:	
Jurisdiction/Town where Proposed Buffer Disturbance is Located:	
Address and/or Parcel # of Proposed Buffer Disturbance:	
Subdivision Name where Proposed Buffer Disturbance is Located (if applicable):	
Type of Buffer (select only one): Water Supply <input type="checkbox"/> ; S.W.IM. <input type="checkbox"/> ; Post-Construction <input type="checkbox"/> ; Goose Creek <input type="checkbox"/> ; or Six Mile Creek <input type="checkbox"/>	
Type of Buffer Disturbance (select all that apply): Removal of Vegetation <input type="checkbox"/> ; Installation of Structure <input type="checkbox"/> ; Addition of Fill <input type="checkbox"/> ; Grading/Land Disturbance <input type="checkbox"/> ; and/or Other Specify:	
Specify the Nature of the Activity that will Disturb the Buffer:	
Specify the Reason for the Buffer Disturbance:	
Square Footage of Parcel:	Square Footage of Disturbed Area:
Square Footage of Buffer on the Parcel: Stream Side Zone	; Managed Use Zone ; Upland Zone ; Total
Square Footage of Buffer to be Disturbed: Stream Side Zone	; Managed Use Zone ; Upland Zone ; Total
Date When Buffer Impact will Occur:	
Date When Mitigation will be Completed:	

Map: *Attach to this application a scaled map (copy of survey is acceptable) containing the following information:*

- Lengths of all boundary/property lines for the parcel and parcel address where the buffer disturbance is to occur.
- Location(s) of all water course(s) on the property, including all perennial and intermittent streams, lakes, ponds and wetlands.
- Location(s) of buildings, parking areas, and other impervious surfaces.
- Location(s) of the buffer area on the parcel, including lengths of all boundary lines and total square footage of the entire buffer (including all buffer zones if applicable).
- The scale of the map, which must not be smaller than 100 feet to the inch.
- Date of map.
- A small scale vicinity map and north arrow.
- Location of the proposed buffer disturbance (boundary lines and total square footage for each zone), including the area of the footprint of the use, the area of the boundary of any clearing and grading activities, and the area of any ongoing maintenance corridors. The boundaries of temporary equipment access areas must be shown on the map but are not included in the total disturbed area calculation provided tree removal and grading do not occur in the area and it is properly stabilized.
- Location, number, size and species of trees greater than two (2) inches in diameter that will be removed from the buffer.

SECTION 2: REQUEST FOR A NO PRACTICAL ALTERNATIVES DETERMINATION

Explain why the basic project purpose cannot be practically accomplished in a manner that would better minimize the disturbance, preserve aquatic life and habitat, and protect water quality.
Explain why the use cannot practically be reduced in size or density, reconfigured or redesigned to better minimize the disturbance, preserve aquatic life and habitat, and protect water quality.
Describe the plans for practices that have been incorporated into the project to minimize the buffer disturbance.

FOR OFFICE USE ONLY: Specify the anticipated impacts of the buffer disturbance on the overall quality and usability of the surface water resource, including its ability to support varied species of aquatic life and meet applicable water quality standards.

FOR OFFICE USE ONLY: Specify any additional conditions that must be met by the applicant to better protect water quality and aquatic life propagation.

SECTION 3: MITIGATION PLAN

Instructions: Select the type of buffer proposed for disturbance, identify the mitigation option being proposed and provide the information requested below that option (only one buffer type can be selected). Also, submit with this application the additional information specified in Section 5.4 of the “Water Quality Buffer Implementation Guidelines” available at the website described at the top of page 1 of this application. **Important Note:** If the mitigation techniques described below are required for compliance with another ordinance, the technique cannot be used as mitigation for water quality buffer impacts.

Water Supply Watershed Buffer Disturbance:

Buffer Restoration on Same Parcel (this is the only mitigation option available for this type of buffer disturbance)

- Is a Level 2 revegetation plan being proposed? Yes No If “No”, explain why:
- Square Footage of Buffer to be Revegetated (if buffer does not have zones, indicate under “Total”): Stream Side Zone _____ ; Managed Use Zone _____ ; and/or Upland Zone _____ Total _____

S.W.I.M. Post-Construction or Lower Lake Wylie Buffer Disturbance:

Installation of Structural BMP

- Type of BMP:
- Size of Drainage Area to be Treated (acres):
- Percentage of Impervious Cover in this Drainage Area :

Buffer Restoration

- Revegetation Type: Level 1 Level 2
- Square Footage of Buffer to be Revegetated (if buffer does not have zones, indicate under “Total”): Stream Side Zone _____ ; Managed Use Zone _____ ; and/or Upland Zone _____ Total _____

Buffer Preservation

- Square Footage of Buffer to be Preserved (if buffer does not have zones, indicate under “Total”): Stream Side Zone _____ ; Managed Use Zone _____ ; and/or Upland Zone _____ Total _____

Wetland Preservation

- Square Footage of Wetland to be Preserved:

Bottom Land Hardwood Preservation

- Square Footage of Bottom Land Hardwood Area to be Preserved:

Controlled Impervious Cover

- Amount of Impervious Cover on Parcel _____ square feet ÷ Size of Parcel _____ square feet = _____ x 100 = _____ %

Open Space Development

- Amount of Preserved Open Space on Parcel _____ square feet ÷ Size of Parcel _____ square feet = _____ x 100 = _____ %

Mitigation Payment/Credit

- Area of Buffer Disturbance _____ square feet x \$10 = \$ _____

Alternative Mitigation Techniques (not pre-approved) Specify:

Goose Creek or Six Mile Creek Buffer Disturbance:

- Buffer Disturbance Area: Footprint of Use in Buffer _____ square feet + Clearing Limits Outside the Footprint _____ square feet + Maintenance Corridor Outside the Footprint and Clearing Limits _____ square feet = _____ square feet

- Mitigation Area: Buffer Disturbance Area _____ square feet x 3 = _____ square feet

Mitigation Payment

- Mitigation Area _____ square feet x \$.96 = \$ _____

Donation of Property

- Appraised Value of Donated Property Interest \$ _____ ÷ Calculated Mitigation Payment \$ _____ = _____ x 100 = _____ %

Stream Buffer Restoration or Enhancement

- Buffer Restoration Area _____ square feet ÷ Calculated Mitigation Area _____ square feet = _____ x 100 = _____ %

- Buffer Enhancement Area _____ square feet ÷ Calculated Mitigation Area _____ square feet = _____ x 100 = _____ %

Unauthorized (Illegal) Buffer Disturbance:

Stream Buffer Restoration (this is the only mitigation option available for this type of buffer disturbance)

- Is a Level 2 revegetation plan being proposed? Yes No If “No”, explain why:
- Square Feet of Buffer to be Revegetated (if buffer does not have zones, indicate under “Total”): Stream Side Zone _____ ; Managed Use Zone _____ ; and/or Upland Zone _____ Total _____

Issuance of the Authorization Certificate: Upon the approval and subsequent signing of this Application, the Authorization Certificate for approval of the buffer disturbance is granted and remains valid for a period of 12 months following the approval date indicated below. All buffer disturbances and mitigation must be performed in strict accordance with the information contained herein and attached to this Application. Failure to do so will immediately render this Authorization Certificate null and void and all buffer disturbances will be subject to penalties. Ensure that proper erosion control is practiced during all land disturbing activities and that once the buffer disturbance is completed that all disturbed erosion are properly stabilized. In addition, diffuse flow through the buffer must be maintained in perpetuity.

FOR OFFICE USE ONLY:

- Disapproved Approved Approved With Modifications Approved With Performance Reservation

Issued By: _____ Date: _____



Appendix 15: Approved Plants for Use in Water Quality Buffers



Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
Deciduous Trees					
Ash, Green	<i>Fraxinus pennsylvanica</i>	sun	moist	60-100 ft./1.5 ft.	prefers moist soils along streams and floodplains, tolerant of flooding for extended periods, used for lawn and shade trees because of its initial rapid growth and adaptability
Basswood (White Basswood, Linden)	<i>Tilia heterophylla /americana</i>	sun	moist	60-100 ft./2-3 ft.	prefers moist soils of valleys and uplands
Beech, American	<i>Fagus grandifolia</i>	sun	moist	80-100 ft./3 ft.	prefers moist soils of uplands and well drained lowlands, nuts important to wildlife
Birch, River (Red Birch)	<i>Betula nigra</i>	sun/partial shade	wet	60-80 ft./1-2 ft.	prefers wet soils along stream banks, swamps and floodplains
Blackhaw	<i>Viburnum prunifolium</i>	sun/shade	moist	20 ft./4 in.	prefers moist soils of upland slopes or around margins of swamps, understory tree
Cherry, Black	<i>Prunus serotina</i>	sun	moist	80 ft./2 ft.	prefers a variety of sites except extremely dry or wet sites
Cottonwood, Eastern (Carolina Poplar)	<i>Populus deltoides</i>	sun/partial shade	wet	100 ft./5 ft.	prefers wet soils along stream banks and floodplains, extensive root system, rapid growth
Elm, Slippery (Red Elm)	<i>Ulmus rubra</i>	sun	moist	70-80 ft./2-3 in.	prefers moist soils on lower slopes and in the floodplain, grows rapidly
Fringe Tree	<i>Chionanthus virginicus</i>	sun/partial shade	moist/dry	30 ft.	prefers moist, well drained soil
Hickory, Bitternut	<i>Carya cordiformis</i>	sun	moist	60-80 ft./1-2 ft.	prefers moist soils in valleys, along streams and in floodplains, fastest growing hickory, makes a good shade tree when planted in moist soils
Hickory, Pignut	<i>Carya glabra</i>	sun	moist to dry	70-80 ft./	common on moist to drier upland sites in association with other oaks and hickories
Hickory, Mockernut	<i>Carya tomentosa</i>	sun	dry	90 ft./	most common hickory, prefers drier soils in upland areas

Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
Deciduous Trees (continued)					
Hickory, Shagbark	<i>Carya ovata</i>	sun	moist	70-90 ft./	prefers moist soils along streams, rivers and in valleys
Hornbeam, American (Blue Beech, Ironwood)	<i>Carpinus caroliniana</i>	sun/partial shade	moist	35 ft./1 ft.	shade tolerant and prefers moist, rich soils along streams and ravines, nutlets eaten by squirrels and song birds
Maple, Ash-leaved (Boxelder)	<i>Acer negundo</i>	sun/partial shade	moist/wet	30-60 ft./2.5 ft.	prefers wet or moist soils along stream banks and floodplains, shade tolerant and reproduces prolifically in open disturbed sites
Maple, Red	<i>Acer rubrum</i>	sun	moist/dry	60-90 ft./3 ft.	prefers wet or moist soils along stream banks and floodplains or drier upland sites, good ornamental because of rapid growth and good fall color, relatively free of insects
Mulberry, Red	<i>Morus rubra</i>	sun	moist	60 ft./2 ft.	prefers moist soils in hardwood forests as well as drier upland slopes, fruit important to wildlife
Oak, Post	<i>Quercus stellata</i>	sun	dry	30-80 ft./1-2 ft.	prefers dry woodlands, drought tolerant well drained soils of uplands and lowlands
Oak, Scarlet	<i>Quercus coccinea</i>	sun	dry	70-80 ft.	prefers dry, sandy, usually acidic soils
Oak, Shumard	<i>Quercus shumardii</i>	sun	moist	60-90 ft./2.5 ft.	prefers moist, well drained soils along streams and floodplains, currently underutilized as an ornamental, striking green leaves and is moderately fast growing
Oak, Southern Red	<i>Quercus falcata</i>	sun	dry	100 ft./3-4 ft.	prefers dry, less fertile soils, occasionally it occurs in moist locations
Oak, Swamp Chestnut (Basket Oak)	<i>Quercus michauxii</i>	sun	moist	60-80 ft./2-3 ft.	prefers moist, well drained soils along streams and in floodplains

Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
Deciduous Trees (continued)					
Oak, Water	<i>Quercus nigra</i>	sun	moist/wet	60-100 ft./2.5 ft.	prefers wet or moist soils along streams, floodplains and swamps, acorns important to wildlife
Oak, White (Stave Oak)	<i>Quercus alba</i>	sun/partial shade	moist/dry	80-100 ft./4-5 ft.	prefers rich, well-drained soils
Oak, Willow	<i>Quercus phellos</i>	sun	moist	90-100 ft./1-2 ft.	prefers low, wet sites of river floodplains, bottomlands or richer upland soils, acorns important to wildlife
Persimmon	<i>Diospyros virginiana</i>	sun/partial shade	moist/dry	20-70 ft./1-2 ft.	prefers moist soils along stream bottoms to drier upland sites, edible fruit important to wildlife, can be planted as an ornamental
Silverbell, Carolina	<i>Halesia carolina</i>	partial shade	moist	30-50 ft./1 ft.	prefers moist wooded slopes and along stream banks
Sourwood	<i>Oxydendrum arboreum</i>	sun/partial shade	moist	50 ft./1 ft.	prefers moist soils and also drier sites
Sycamore (Planetree)	<i>Platanus occidentalis</i>	sun	wet	60-100 ft./3-5 ft.	prefers moist sites along streams and bottomlands, also tolerates drier upland sites, grows rapidly and is planted as a shade tree or ornamental
Tulip Poplar (Yellow Poplar)	<i>Liriodendron tulipifera</i>	sun	moist	80-120 ft./3-4 ft.	prefers moist, well drained sites along streams, river bottoms and lower upland slopes, intolerant of shade, should be planted where it has a lot of space to grow
Tupelo, Black (Blackgum)	<i>Nyssa sylvatica</i>	sun	moist	50-100 ft./2-3 ft.	prefers moist, well drained soils along streams and dry upland sites, intolerant of prolonged flooding
Walnut, Black	<i>Juglans nigra</i>	sun	moist	70-100 ft./4 ft.	prefers rich woods on moist, well-drained soils, other plants may not do well if planted next to Black Walnut due to the root production of juglone
Willow, Black	<i>Salix nigra</i>	sun/partial shade	wet	80-100 ft./2.5 ft.	prefers stream banks and floodplains, used for erosion



Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
(Swamp Willow)					control along streams due to dense root system
Understory Trees (Deciduous)					
Blackhaw, Rusty	<i>Viburnum rufidulum</i>	sun/partial shade	moist	25 ft./4-5 in.	prefers moist lower slopes to drier uplands, good ornamental, understory tree
Dogwood, Flowering	<i>Cornus florida</i>	sun/partial shade	moist/dry	30 ft./8 in.	prefers moist or dry soils along streams, floodplains and lower slopes, understory tree
Dogwood, Silky	<i>Cornus amomum</i>	sun/partial shade	wet/moist	12 ft.	prefers moist soils along streams and floodplains
PawPaw	<i>Asimina triloba</i>	sun/partial shade	moist	25 ft./1-2 ft.	prefers moist sites along floodplains, can be used for naturalizing along streams or moist sites, fruit is source of food for wildlife
Redbud (Judas Tree)	<i>Cercis canadensis</i>	sun	moist	40 ft./8 in.	prefers moist soils along streams and bottomlands to drier slopes
Snowbell, Bigleaf	<i>Styrax grandifolius</i>	sun/partial shade	moist	20 ft./1-2 ft.	prefers moist soils along streams, valleys, and uplands, good understory tree that could be used as an ornamental
Evergreen Trees					
Cedar, Eastern Red	<i>Juniperus virginiana</i>	sun	moist/dry	40-60 ft./1-2 ft.	prefers a wide variety of dry upland areas as well as moist stream banks and floodplains, not shade tolerant, should not be planted next to apple trees
Pine, Shortleaf	<i>Pinus echinata</i>	sun/partial shade	dry	70-100 ft./2-3 ft.	prefers a wide variety of upland soils including heavy clays of Piedmont
Pine, Virginia	<i>Pinus virginiana</i>	sun	dry	40-70 ft./1-1.5 ft.	prefers a wide variety of upland areas and quickly invades abandoned farmland and burned areas
Understory Trees (Evergreen)					
Holly, American	<i>Ilex opaca</i>	partial shade	moist/wet	40-70 ft./1-2 ft.	prefers moist sites and is an understory species
Alder, Common (Hazel Alder, Tag Alder)	<i>Alnus serrulata</i>	sun/partial shade	wet	20 ft./4 in.	prefers wet soil along stream banks
Azalea,	Rhododendron	sun/partial	moist	8 ft./2-3 ft.	prefers stream banks in

Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
Pinxter	<i>periclymenoides</i> (<i>nudiflorum</i>)	shade			deciduous forests and can be found in low woodlands
Deciduous Shrubs					
Azalea, Swamp	<i>Rhododendron viscosum</i>	sun/partial shade	moist/dry	8 ft./3 ft.	prefers a variety of upland sites and stream banks
Beautyberry, American	<i>Callicarpa americana</i>	sun/partial shade	moist/dry	5-10 ft.	Prefers moist to dry soils
Buttonbush (Honey Balls)	<i>Cephalanthus occidentalis</i>	sun/partial shade	wet	20 ft./4 in.	prefers moist sites along streams, swamps, floodplains and edges of ponds, is used as an ornamental in naturally moist or poorly drained sites
Elder, American (Elderberry)	<i>Sambucus canadensis</i>	sun/partial shade	moist/wet	16 ft./6 in.	prefers wet soils along stream banks, drainage areas and bottomlands near margins of fields and forests
Mountain Laurel	<i>Kalmia latifolia</i>	partial shade	moist/dry	20-25 ft./8-10 in.	prefers well drained, acidic soil with ample humus
Possum haw (Deciduous holly)	<i>Ilex decidua</i>	sun/partial shade	dry/moist	20 ft.	prefers moist, acidic, organic soils
Red Chokeberry	<i>Sorbus (Aronia) arbutifolia</i>	sun/partial shade	wet/moist	6-9 ft.	prefers rich, moist, well-drained, slightly acid soil
Sparkleberry	<i>Vaccinium arboreum</i>	sun/partial shade	moist/dry	25 ft./6 in.	prefers sandy upland soils
Spicebush	<i>Lindera benzoin</i>	shade	wet/moist	6-12 ft.	prefers moist fertile soil
Strawberry Bush	<i>Euonymus americanus</i>	shade	dry/moist	3-5 ft/	prefers thick woods, swampy areas and the margin of stream sand bars
Sweet Shrub	<i>Calycanthus floridus</i>	sun/partial shade	moist/dry	5 ft./3-5 in.	prefers moist slopes and moist soils along stream banks
Viburnum, Possumhaw	<i>Viburnum nudum</i>	sun/partial shade	moist/wet	16 ft./4 in.	prefers moist soils near streams and swamps, used as an ornamental on moist to poorly drained sites, fruit good source of wildlife food
Witch-hazel	<i>Hamamelis virginiana</i>	partial shade	moist	30-35 ft.	prefers well-drained, acidic soil amended with humus
Virigina Willow	<i>Itea virginica</i>	partial shade	moist	5 ft. /3-5 in.	prefers moist but well drained soil
Southern Arrowood	<i>Viburnum dentatum</i>	sun/partial shade	moist/wet	16 ft / 4 in.	tolerates saturation or inundation

Approved Plants for Use in Water Quality Buffers

Common Name	Botanical Name	Light Conditions	Soil Conditions	Height / Diameter	Notes
Wildflowers					
Black-eyed Susan	<i>Rudbeckia hirta</i>	sun	dry		yellow flower, attract birds and butterflies
Butterfly Weed	<i>Asclepias tuberosa</i>	sun/partial shade	dry		orange flower, attracts butterflies
Columbine, Eastern Wild	<i>Aquilegia canadensis</i>	shade	moist/dry	2-3 ft.	red flower, attracts hummingbirds and butterflies
Cardinal Flower	<i>Lobelia cardinalis</i>	shade	moist	2-4 ft.	red flowers
Goatsbeard	<i>Aruncus dioicus</i>	shade	moist	2-4 ft.	white flowers
Joe Pye Weed	<i>Eupatorium fistulosum</i>	sun	wet		light purple flower, attracts butterflies
Mallow, Rose	<i>Hibiscus moscheutos</i>	sun/partial shade	moist	5-6 ft.	pink-white flower
Milkweed, Pink Swamp	<i>Asclepias incarnata</i>	sun	moist	3-5 ft.	white-pink flowers, attracts butterflies
Purple Coneflower	<i>Echinacea purpurea</i>	sun	dry		purple flower, attracts birds and butterflies
Swamp Sunflower	<i>Helianthus angustifolius</i>	sun/partial shade	moist		yellow flower, attracts wildlife
Groundcover					
Broom Sedge (bunch grass)	<i>Andropogon virginicus</i>	sun	dry/moist	11-12 in.	drought tolerant, good for revegetating stream banks
Christmas fern	<i>Polystichium acrostichoides</i>	shade	moist	18 in.	prefers shaded, north or east-facing slopes in humus-rich soil
Cinnamon fern	<i>Osmunda cinnamomea</i>	shade/partial shade	moist/wet	12-20 in.	prefers swamps, bogs and moist woodlands
Deer Tongue (bunch grass)	<i>Dicanthelium (Panicum) clandestinum</i>	sun	dry/moist	7-8 in.	takes a few years to establish, low woods, ditches
Dog Hobble	<i>Leucothoe fontanesiana (editorum)</i>	sun/partial shade	dry/moist	3-6 ft.	prefers acidic, well drained organic soils in partial to full shade, all parts of plant are poisonous if ingested
Southern Lady Fern	<i>Athyrium asplenoides</i>	shade	moist/wet	12-18 in.	prefers dappled sunlight to light shade, moist conditions, and a loose loamy soil that is slightly acidic
Switch Grass (bunch grass)	<i>Panicum anceps (or - virgatum)</i>	sun	dry/moist	11-12 in.	takes a few years to establish, low woods, ditches, fields
Virginia Wild Rye (bunch grass)	<i>Elymus virginicus</i>	sun	moist	11-12 in.	takes a few years to establish, low woods, ditches, fields



Approved Plants for Use in Water Quality Buffers

Common Name(1)	Botanical Name	Percentage of Mix(2)
Herbaceous Groundcover Seed Mix		
Common white snakeroot	<i>Ageratina altissima</i>	5
Tickseed sunflower	<i>Bidens aristosa</i>	10
Partridge pea	<i>Chamaecrista fasciculata</i>	10
River oats	<i>Chasmanthium latifolium</i>	10
Longstalk coreopsis	<i>Coreopsis lanceolata</i>	10
Boneset	<i>Eupatorium perfoliatum</i>	5
Narrowleaf sunflower	<i>Helianthus angustifolius</i>	10
Sundrops	<i>Oenothera biennis</i>	5
Pennsylvania smartweed	<i>Polygonum pennsylvanicum</i>	10
Black-eye Susan	<i>Rudbeckia hirta</i>	10
Blue-stem goldenrod	<i>Solidago caesia</i>	5
Heath aster	<i>Symphotrichum pilosum</i>	10

(1) The above Herbaceous Ground Cover Seed Mixes are all commercially available. Below are a few links to nurseries that carry this stock. The seed mix can be obtained from Ernst Seed Co.

<http://www.curenursery.com/plants.htm>

<http://www.mellowmarshfarm.com/>

<http://coastalplainnursery.com/>

<http://www.ernstseed.com/seed-mixes/>

(2) Seed mix at 30 pounds per acre. Overseed with 20 pounds per acre rye grain (*Secale cereale*) and 10 pounds per acre Foxtail millet (*Setaria italica*).

References: Brown and Kirkman "Trees of Georgia and Adjacent States", Radford, Ashe, Bell "Manual of the Vascular Flora of the Carolinas", Justice, Bell "Wildflowers of North Carolina", Chris Matthews, "Riparian and Shoreline Mitigation Plantings"



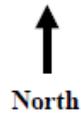
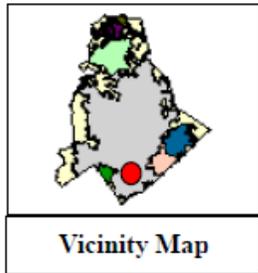
Appendix 16: Examples of Water Quality Buffer Revegetation Plans

Water Quality Buffer Revegetation Plan (October 21, 2011)

Level 1 Revegetation

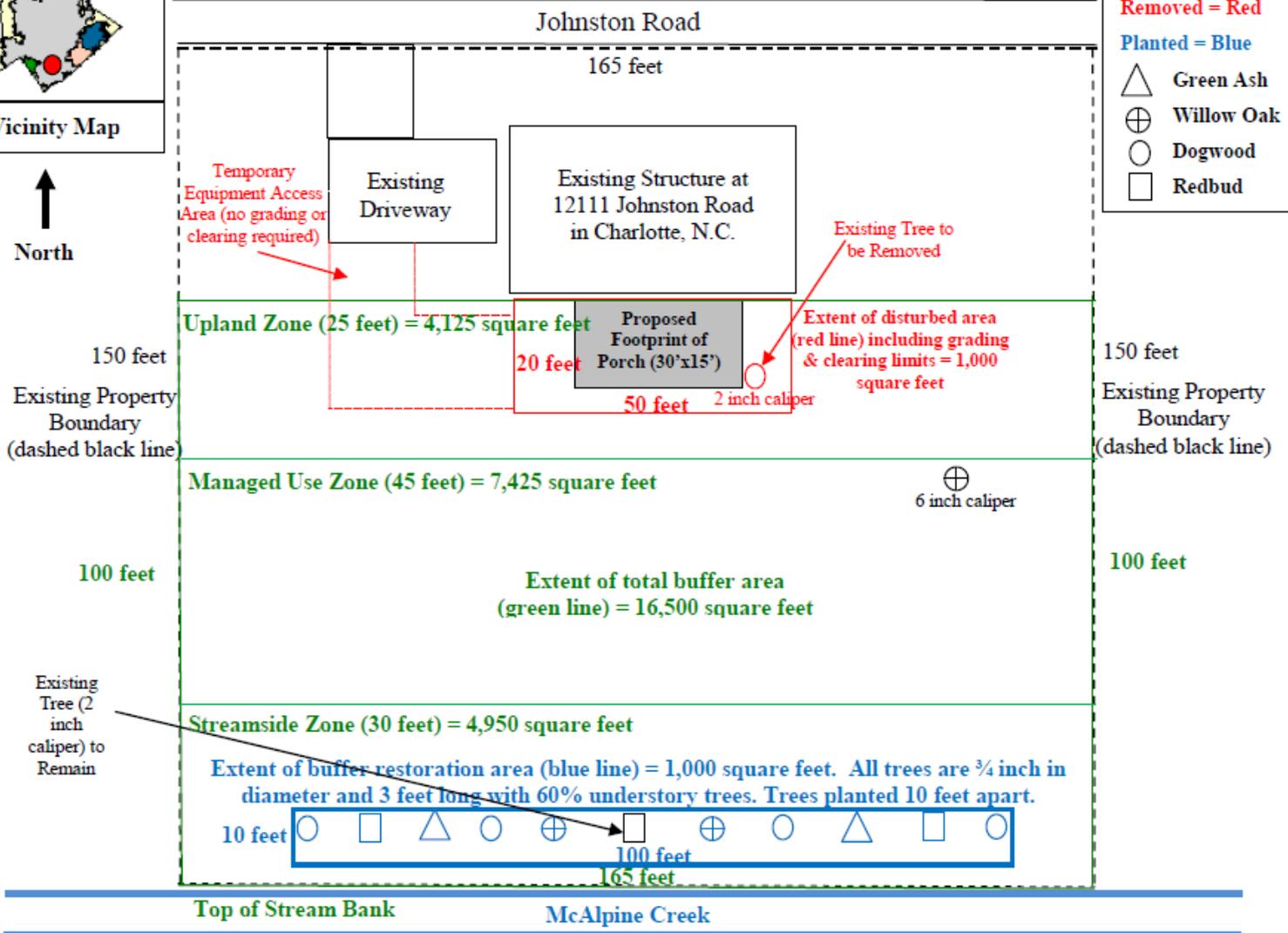
Scale: 1 inch = 30 feet

Comment regarding this example: This Buffer Revegetation Plan is an example for an authorized buffer disturbance such as might occur along a stream for an expansion to an existing dwelling.



Vegetation Key:

Existing	= Black
Removed	= Red
Planted	= Blue
	Green Ash
	Willow Oak
	Dogwood
	Redbud



Notes:

1. The total area of the lot is 24,750 square feet (150 feet x 165 feet).
2. 10 live stake trees to be planted 10 feet apart in the restoration area at a density of 10 trees/1000 square feet for a Level 1 Revegetation.
3. All trees to be planted will be a minimum of 3/4 inch in diameter and 3 feet long.
4. All exposed soil in the restoration area will be covered with the approved herbaceous seed mix specified in the Buffer Implementation Guidelines.
5. All disturbed areas outside the buffer will be stabilized with Kentucky 31 Fescue within 24 hours following the completion of construction activities.
6. Tree shelters will be used to protect against deer grazing and mower damage.
7. Organic mulch will be applied in a ring around the base of new trees at a minimum depth of two (2) inches to aid in establishment and prevent competition by ground layer plantings.
8. Following buffer restoration, diffuse flow will be maintained through the buffer in perpetuity.
9. Chemical fertilizers and pesticides will not be applied in the buffer.
10. All plants will be maintained in perpetuity and will be replaced as necessary to ensure that the original planting density is maintained.
11. Following the complete installation of the approved Revegetation Plan, a final inspection and written approval must be made by Charlotte-Mecklenburg Storm Water Services. Call (704) 336-5456 to schedule a final inspection.
12. It is the responsibility of the property owner to maintain the revegetation site and repair, protect, and add additional controls to protect the buffer as necessary at their sole expense.



Appendix 17: Request for Additional Information Regarding Requested Mitigation

<DATE>

CERTIFIED MAIL (RETURN RECEIPT REQUIRED)

<ADDRESS>

Re: Requested Water Quality Buffer Disturbance
Authorization Certificate Application # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed its review of the Authorization Certificate Application (#) <SPECIFY ASSIGNED NUMBER> that you submitted for the requested buffer disturbance at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. Please be aware that CMSWS has found the information you submitted to be acceptable. However, final approval of your request is contingent upon your submittal and subsequent approval by CMSWS of the following:

- <INCLUDE THE FOLLOWING FOR MITIGATION USING BMPS TO MEET 85% TSS REMOVAL> Submit construction plans sealed by a professional engineer for the installation of structural BMP(s) to achieve an average annual 85% total suspended solids (TSS) removal efficiency for runoff generated from the first inch of rainfall from the built-upon area on the property where the buffer disturbance is proposed. All BMPs must comply with the criteria specified in the most recent edition of the Charlotte-Mecklenburg BMP Design Manual that is available on the following website: <http://stormwater.charmeck.org> (select "Regulations", select "Post-Construction Programs & Manuals", select "Mecklenburg County, Towns...", select "Charlotte-Mecklenburg BMP Design Manual").
- <INCLUDE THE FOLLOWING FOR MITIGATION USING INFILTRATION DEVICES NOT REQUIRING DESIGN BY A PROFESSIONAL ENGINEER> Submit construction plans for the <SPECIFY TYPE OF STRUCTURE(S)>. These plans must be to scale and must include the dimensions and basic layout of the structure(s). Plans do not have to be prepared by a professional engineer.
- <INCLUDE THE FOLLOWING FOR MITIGATION USING BMPS TO MEET 85% TSS REMOVAL AND INFILTRATION DEVICES WHERE MAINTENANCE IS REQUIRED> Submit an Operation and Maintenance Agreement and Maintenance Plan



700 North Tryon Street
Charlotte, NC 28202
Fax: 704.336.4391

for each BMP. Please be aware that the property owner is responsible for the inspection



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>



and maintenance of the BMP(s) in perpetuity as specified in the Operation and Maintenance Agreement. The Maintenance Plan describes how this maintenance will be performed, including inspection schedules. Digital versions of these documents are available on the website indicated above by selecting “Forms” and “BMP Maintenance and Inspection Checklists.” Upon approval by CMSWS, these documents must be recorded at the Mecklenburg County Register of Deeds Office along with a plat showing the location of all structures and the wording “Water Quality Treatment Device – Do Not Disturb.”

Within 30 calendar days of the date of this letter, mail the above information to the attention of <INSPECTOR’S NAME> at <INSPECTOR’S ADDRESS>. If this timeframe is unacceptable, please respond in writing with an explanation of your time constraints and a proposed new schedule for providing the requested information. If we do not hear from you in 30 calendar days, we will assume that you no longer plan to pursue this project and your request for a buffer disturbance will be considered null and void.

Please be aware that the review process for your Authorization Certificate Application will not proceed until all the above has been received by CMSWS. The water quality buffer cannot be disturbed until you receive written notification from this Office that the Authorization Certificate Application has been approved. Failure to comply constitutes a violation of the <NAME OF ORDINANCE> which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation.

Please contact <INSPECTOR’S NAME> at <INSPECTOR’S PHONE NUMBER> if you have any questions.

Sincerely,

<INSPECTOR’S NAME>
<INSPECTOR’S TITLE>
Charlotte-Mecklenburg Storm Water Services



Appendix 18: Notice of Violation (NOV) for a Buffer Disturbance



<DATE>

CERTIFIED MAIL (RETURN RECEIPT REQUIRED)

<ADDRESS>

Re: Notice of Violation
<NAME OF ORDINANCE>
<ADDRESS OF VIOLATION>

Dear :

On <INSPECTION DATE>, <INSPECTOR'S NAME> of Charlotte-Mecklenburg Storm Water Services (CMSWS) conducted an investigation of your property located at <ADDRESS OF VIOLATION> in <JURISDICTION>, North Carolina. The investigation was conducted by authority granted under the <NAME OF ORDINANCE> ("Ordinance"). As a result of this investigation, the condition described below was found on the property in violation of Section <SECTION NUMBER> of the Ordinance:

- <DESCRIPTION OF VIOLATION(S)>.

In order to bring the site into compliance with Ordinance requirements, you must do the following:

- Immediately discontinue all buffer disturbance activities.
- By <DATE>, submit the completed form entitled "Authorization Certificate Application" (see attached), including an attached Water Quality Buffer Revegetation Plan, to <INSPECTOR'S NAME> of CMSWS at <OFFICE ADDRESS>. Instructions for the proper completion of this form and the attached Plan as well as a digital version of the application are available on the following website: <http://stormwater.charmeck.org> (select "Regulations", select "Buffers & BMPs", select "Water Quality Buffer Guidelines and Application for Buffer Disturbance").

CMSWS will complete a review of your application within 30 days of receipt. Upon approval, written notification will be issued to you by CMSWS, including a deadline for completion of all the activities specified in the Water Quality Buffer Revegetation Plan. Immediately upon completion of these activities, notify <INSPECTOR'S NAME> of CMSWS at <INSPECTOR'S PHONE NUMBER>. CMSWS will conduct a follow up inspection of



your property to ensure compliance with the approved revegetation plan and Ordinance requirements. You will be notified of the results of this inspection.

Failure to comply with the above requirements constitutes a violation of the Ordinance, which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation. You will be notified if penalties are assessed.

Please contact <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER> if you have any questions or if you do not have internet access and require a hard copy of the aforementioned instructions.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>
Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application

Appendix 19: Corrective Action Request (CAR) for a Buffer Disturbance

<DATE>

<ADDRESS>

Re: Corrective Action Request
<NAME OF ORDINANCE>
<ADDRESS OF VIOLATION>

Dear :

On <INSPECTION DATE>, <INSPECTOR'S NAME> of Charlotte-Mecklenburg Storm Water Services (CMSWS) conducted an investigation of your property located at <ADDRESS OF VIOLATION> in <JURISDICTION>, North Carolina. The investigation was conducted by authority granted under the <NAME OF ORDINANCE> ("Ordinance"). As a result of this investigation, the condition described below was found on the property in violation of Section <SECTION NUMBER> of the Ordinance:
<DESCRIPTION OF VIOLATION(S)>.

To comply with the water supply watershed buffer requirements of the Zoning Ordinance, it will be necessary for you to do the following:

- Immediately discontinue all buffer disturbance activities.
- By <DATE>, submit the completed form entitled "Authorization Certificate Application" (see attached), including an attached Water Quality Buffer Revegetation Plan, to <INSPECTOR'S NAME> of CMSWS at <OFFICE ADDRESS>. Instructions for the proper completion of this form and the attached Plan as well as a digital version of the application are available on the following website: <http://stormwater.charmeck.org> (select "Regulations", select "Buffers & BMPs", select "Water Quality Buffer Guidelines and Application for Buffer Disturbance").

CMSWS will complete a review of your application within 30 days of receipt. Upon approval, written notification will be issued to you by CMSWS, including a deadline for completion of all the activities specified in the Water Quality Buffer Revegetation Plan. Immediately upon completion of these activities, notify <INSPECTOR'S NAME> of CMSWS at

<INSPECTOR'S PHONE NUMBER>. CMSWS will conduct a follow up inspection of your property to ensure compliance with the approved revegetation plan and Ordinance requirements. You will be notified of the results of this inspection.

Failure to comply with the above requirements will result in a Zoning Notice of Violation.

Please contact <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER> if you have any questions or if you do not have internet access and require a hard copy of the aforementioned instructions.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>
Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application

cc: David Caldwell – MCWQP
- Zoning



Appendix 20: Corrective Action Request (CAR) for a Buffer Disturbance (Cornelius)



<DATE>

<VIOLATOR’S NAME>
 <MAILING ADDRESS>

**RE: CHARLOTTE-MECKLENBURG STORMWATER SERVICES (CMSWS)
 CORRECTIVE ACTION REQUEST**

Dear <VIOLATOR’S NAME>:

CMSWS would like to inform you of a violation of the Town of Cornelius *Land Development Code* buffer requirements as described in the table below.

Violation Description

<i>Date of Inspection:</i>	
<i>Property Owner:</i>	
<i>Property Address:</i>	
<i>MCWQP Inspector:</i>	
<i>Violation:</i>	It was determined by the CMSWS inspector through an on-site investigation that the property is located within the Lake Norman Watershed Overlay District, which requires a (insert width) foot undisturbed buffer. Natural vegetation has been removed from within the regulated buffer.
<i>Corrective Action:</i>	Within 30 days of receipt of this notice, submit the form entitled “Authorization Certificate Application” (see attached), including an attached Water Quality Buffer Revegetation Plan, to <INSPECTOR’S NAME> of CMSWS at <OFFICE ADDRESS>. Instructions for the proper completion of this form and the attached Plan as well as a digital version of the application are available on the following website: http://stormwater.charmeck.org (select “Regulations”, select “Buffers & BMPs”, select “Water Quality Buffer Guidelines and Application for Buffer Disturbance”). Failure to submit this information will result in a Zoning Notice of Violation. Please contact the undersigned at <INSPECTOR’S PHONE NUMBER> for assistance in creating a restoration plan.



If you wish to contest this determination, you must submit written notification to this effect to CMSWS within 15 days of this notice.

If you have any questions concerning this matter, please do not hesitate to contact me at <INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application

cc: Wayne Herron – Town of Cornelius
Brian Sifford – LUESA Zoning
David Caldwell – Water Quality

**Appendix 21: Notification of Disapproval of Water Quality Buffer Revegetation Plan
Submitted for Compliance with NOV or CAR**

<DATE>

<ADDRESS>

Re: Notification of Disapproval of Water Quality Buffer Revegetation Plan
<ORDINANCE NAME>
<ADDRESS OF BUFFER>

Dear :

Charlotte-Mecklenburg Storm Water Services has disapproved the "Authorization Certificate Application" that you submitted in accordance with the notice issued to you on <DATE OF NOV> for violation of the <NAME OF ORDINANCE> ("Ordinance"). The following deficiencies were detected in the application that resulted in its disapproval:

- <LIST DEFICIENCIES>
-
-

In order to comply with the Ordinance, you must resubmit a revised application and attached Water Quality Buffer Revegetation Plan that satisfactorily addresses the deficiencies listed above no later than ____<DATE>. Failure to comply constitutes a violation of the Ordinance, which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation. You will be notified if penalties are assessed.

If you have any questions, please contact <INSPECTOR'S NAME> at
<INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>



**Appendix 22: Notification of Approval of Water Quality Buffer Revegetation Plan
Submitted for Compliance with NOV or CAR**



<DATE>

<ADDRESS>

Re: Notification of Approval of Water Quality Buffer Revegetation Plan
<ORDINANCE NAME>
<ADDRESS OF BUFFER>

Dear :

Charlotte-Mecklenburg Storm Water Services has approved the "Authorization Certificate Application" that you submitted in accordance with the notice issued to you on <DATE OF NOV> for violation of the <NAME OF ORDINANCE> ("Ordinance"). In order to comply with Ordinance requirements, you must complete the following actions no later than <DATE>.

- Complete the implementation of the Water Quality Buffer Revegetation Plan, including the installation of all plantings, mulch, etc. Please be aware that buffer revegetation must be performed in strict accordance with the approved plan.
- Notify <INSPECTOR'S NAME> at <INSPECTORS PHONE NUMBER> immediately upon completion of all the activities required by the Authorization Application and Water Quality Buffer Revegetation Plan so that a compliance inspection can be conducted. Failure to provide such notification will result in an automatic compliance inspection by deadline indicated above.
- To prevent future disturbance of the stream buffer restoration area, the full extent of the area must be delineated on a map produced by a N.C. Registered Surveyor that also shows all parcel and buffer boundaries. The following language must be included on the map identifying the buffer restoration area: "Water Quality Buffer Restoration Area - Disturbance of this area is strictly prohibited by law." This map must be recorded at the Mecklenburg County Register of Deeds Office and a copy provided to Charlotte-Mecklenburg Storm Water Services.

Failure to complete the above actions by the deadline indicated constitutes a violation of the Ordinance, which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation. In addition, the property owner must maintain the revegetated area in perpetuity. Failure to do so constitutes a violation of the above ordinance.

If you have any questions, please contact <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.





700 North Tryon Street
Charlotte, NC 28202
Fax: 704.336.4391

Sincerely,

<INSPECTOR'S NAME

<INSPECTOR'S TITLE

Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>





Appendix 23: Notification of Noncompliance with Water Quality Buffer Revegetation Plan Submitted for Compliance with NOV or CAR

<DATE>

<ADDRESS>

Re: Notification of Noncompliance with the Water Quality Buffer Revegetation Plan
<ORDINANCE NAME>
<ADDRESS OF BUFFER>

Dear :

Charlotte-Mecklenburg Storm Water Services has completed an inspection of the buffer revegetation performed at the above referenced address in accordance with the notice issued to you on <DATE OF NOV> for violation of the <NAME OF ORDINANCE> ("Ordinance"). The following deficiencies were detected during this inspection resulting in noncompliance with the Water Quality Buffer Revegetation Plan approved by this Office on <DATE OF APPROVAL>:

- <LIST DEFICIENCIES>
-
-

In order to comply with the Ordinance, you must fulfill all the requirements of the approved Authorization Certificate (see attached) and Water Quality Buffer Revegetation Plan by correcting the deficiencies listed above by no later than ____<COMPLIANCE DATE>. Failure to comply constitutes a violation of the Ordinance, which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation. You will be notified if penalties are assessed.

If you have any questions, please contact <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services

Attachment: Authorization Certificate Application



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>





**Appendix 24: Notification of Compliance with Water Quality Buffer Revegetation Plan
Submitted for Compliance with NOV or CAR**

<DATE>

<ADDRESS>

Re: Notification of Compliance with Water Quality Buffer Revegetation Plan
<ORDINANCE NAME>
<ADDRESS OF BUFFER>

Dear :

Charlotte-Mecklenburg Storm Water Services has completed an inspection of the buffer revegetation performed at the above referenced address in accordance with the notice issued to you on <DATE OF NOV> for violation of the <NAME OF ORDINANCE> ("Ordinance"). As a result of this inspection, it has been determined that the buffer on the property has been satisfactorily revegetated in compliance with the Authorization Certificate (see attached) and Water Quality Buffer Revegetation Plan approved by this Office on <DATE OF APPROVAL> thereby bringing the property into compliance with Ordinance requirements.

Please be aware that the owner of this property is responsible for maintaining this buffer in perpetuity. If vegetation dies, the owner must replace it with the same species and plant size specified in the approved Water Quality Revegetation Plan. In addition, sheet flow must be maintained across the buffer in perpetuity. Charlotte-Mecklenburg Storm Water Services will conduct periodic inspections of the buffer to ensure ongoing compliance. Failure to comply constitutes a violation of the Ordinance, which carries a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation.

If you have any questions, please contact <INSPECTOR'S NAME> at
<INSPECTOR'S PHONE NUMBER>.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services



Appendix 25: Notification of Mitigation Inspection With Deficiencies



<DATE>

<ADDRESS>

Re: Failure to Satisfactorily Maintain Water Quality Buffer Mitigation Measure
Authorization Certificate # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed an inspection of the mitigation measure installed on <DATE MITIGATION COMPLETED> for water quality buffer disturbances at <ADDRESS OF BUFFER DISTURBANCE>. Based on this inspection, CMSWS has determined that the mitigation measure is not being satisfactorily maintained in accordance with the approved Authorization Certificate # <SPECIFY ASSIGNED NUMBER> as specified below:

- <LIST DEFICIENCIES>
-
-

Please be aware that the above deficiencies constitute a violation of the <NAME OF ORDINANCE> which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day the deficiencies remain unresolved constitutes a separate violation. You are hereby directed to correct these deficiencies by <COMPLIANCE DEADLINE>. You will be notified if penalties are assessed.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services





Appendix 26: Notification of Mitigation Inspection Without Deficiencies

<DATE>

<ADDRESS>

Re: Inspection of Water Quality Buffer Mitigation Measure
Authorization Certificate # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed an inspection of the mitigation measure installed on <DATE MITIGATION COMPLETED> for water quality buffer disturbances at <ADDRESS OF BUFFER DISTURBANCE>. Based on this inspection, CMSWS has determined that the mitigation measure is being satisfactorily maintained in accordance with the approved Authorization Certificate # <SPECIFY ASSIGNED NUMBER> and in compliance with the <NAME OF ORDINANCE>.

Thank you for your efforts to maintain this mitigation measure that serves to protect the quality of the downstream surface water resources.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services



Appendix 27: Notification for Shoreline Stabilization and Dredging Projects



<DATE>

<ADDRESS>

Re: <EXCAVATION OR SHORELINE STABILIZATION> Application
<ADDRESS OF PROPOSED EXCAVATION OR SHORELINE STABILIZATION>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has reviewed the application to conduct <AN OR A> <EXCAVATION OR SHORELINE STABILIZATION> project on <LAKE NORMAN, MOUNTAIN ISLAND LAKE OR LAKE WYLIE> at the above referenced address. Please be aware that this property is located within the <LAKE NORMAN, MOUNTAIN ISLAND LAKE, UPPER LAKE WYLIE OR LOWER LAKE WYLIE> Drinking Water Supply Watershed Critical Area, which requires a <50-FOOT FOR LAKE NORMAN AND LOWER LAKE WYLIE, 100-FOOT FOR MOUNTAIN ISLAND LAKE AND UPPER LAKE WYLIE> undisturbed lake buffer. The buffer regulations allow for excavation and shoreline stabilization as long as a plan is submitted and approved by this Office. We have no objection to your proposal, subject to the following conditions:

- A pre-construction meeting is required prior to any work being done on the site. Contact <FOR LAKE NORMAN INDICATE BRIAN SIFFORD AT 980-721-0924 AND FOR ALL OTHER LAKES INDICATE ANDREW MARTIN AT 980-721-2094> to schedule this meeting.
- <DO NOT INCLUDE THIS BULLET FOR MOUNTAIN ISLAND LAKE> All work must be done by water using a barge. No disturbance to the buffer will be allowed. Any disturbances to the buffer will be considered a violation of the <LAKE NORMAN, MOUNTAIN ISLAND LAKE, UPPER LAKE WYLIE OR LOWER LAKE WYLIE> Water Supply Protection regulations.
- Erosion / sedimentation must be controlled at all times during the project.
- Following the completion of the project, all disturbed areas must be stabilized with an approved ground cover.

Please feel free to contact me at 704/336-5452 if you have any questions. Thank you.

Sincerely,

David M. Caldwell
Environmental Supervisor

cc: <NAME OF CONTRACTOR >



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>





**Appendix 28: Notification of Incomplete Authorization Certificate Application Submitted
for a Proposed Buffer Disturbance**

<DATE>

CERTIFIED MAIL (RETURN RECEIPT REQUIRED)

<ADDRESS>

Re: Proposed Water Quality Buffer Disturbance
Authorization Certificate Application # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has received the Authorization Certificate Application (#) <SPECIFY ASSIGNED NUMBER> that you submitted for the proposed buffer disturbance at the above referenced location. Please be aware that the application is incomplete. In order for CMSWS to complete its review of the application, the following information must be received:

- <LIST DEFICIENCIES>
-
-

By <DEADLINE>, provide the above information to the attention of <INSPECTOR'S NAME> at <INSPECTOR'S ADDRESS>. If this timeframe is unacceptable, please respond in writing with an explanation of your time constraints and a proposed new schedule for providing the requested information. If we do not hear from you in 30 calendar days, we will assume that you no longer plan to pursue this project and your request for a buffer disturbance will be considered null and void.

Please be aware that the review process for your Authorization Certificate Application will not proceed until all the above has been received by CMSWS. The water quality buffer cannot be disturbed until you receive written notification from this Office that the Authorization Certificate Application has been approved. Failure to comply constitutes a violation of the <NAME OF ORDINANCE> which carries a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation.

Please contact <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>
if you have any questions.

Sincerely,

<INSPECTOR'S NAME>
<INSPECTOR'S TITLE>
Charlotte-Mecklenburg Storm Water Services



Appendix 29: Notification to Adjacent Property Owners of a Proposed Buffer Disturbance

<DATE>

<ADDRESS>

Re: Public Notification of Proposed Water Quality Buffer Disturbance
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Please be aware that Charlotte-Mecklenburg Storm Water Services has received a request for approval to disturb <TOTAL AREA OF PROPOSED DISTURBANCE> of water quality buffer adjacent to <NAME OF SURFACE WATER> located at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. This disturbance will include <BRIEF DESCRIPTION OF DISTURBANCE>. To mitigate for this buffer disturbance and protect surface water quality, the requesting party is proposing to <BRIEF DESCRIPTION OF THE NATURE OF THE PROPOSED MITIGATION>.

The purpose of this public notification is to make you aware of the proposed water quality buffer disturbance and to give you an opportunity to comment. If you need additional information, please feel free to contact <INSPECTOR'S NAME at <INSPECTOR'S PHONE NUMBER>. Your comments must be submitted to the attention of <INSPECTOR'S NAME at <INSPECTOR'S ADDRESS before <DEADLINE FOR SUBMITTAL OF COMMENTS>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services



To report pollution or drainage problems call: 311
<http://stormwater.charmeck.org>



**Appendix 30: Notification of Disapproval of Authorization Certificate Application
Submitted for a Proposed Buffer Disturbance**

<DATE>

<ADDRESS>

Re: Disapproval of Water Quality Buffer Disturbance
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed its review of your requested disturbance of an estimated <TOTAL AREA OF PROPOSED DISTURBANCE> of water quality buffer adjacent to <NAME OF SURFACE WATER> located at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. Based on this review, CMSWS does hereby deny the requested buffer disturbance based on the following determination:

- <LIST REASONS FOR DISAPPROVAL>
-
-

Please be aware that the requested buffer disturbance at the referenced property is prohibited. Failure to comply constitutes a violation of the <NAME OF ORDINANCE>. Each day of noncompliance constitutes a separate violation.

The denial of the requested buffer disturbance can be appealed to <INDICATE THE APPEAL BODY>. Forms for initiating this appeal are available at <INDICATE WHERE TO OBTAIN APPEAL FORMS>.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services



Appendix 31: Notification of Approval of Authorization Certificate Application Submitted for a Proposed Buffer Disturbance

<DATE>

<ADDRESS>

Re: Approval of Authorization Certificate for Water Quality Buffer Disturbance
Authorization Certificate # <NUMBER OFF APPLICATION>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed its review of your requested disturbance of an estimated <TOTAL AREA OF PROPOSED DISTURBANCE> of water quality buffer area adjacent to <NAME OF SURFACE WATER> at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. Based on this review, CMSWS does hereby approve the requested buffer disturbance.

Please be aware that buffer mitigation must be performed in strict accordance with the information contained in the attached Authorization Certificate Application (#) <CERTIFICATION NUMBER ON APPLICATION> and all attachments (see attached). If there is a change from any of the information contained in the attached Authorization Certificate Application, you must resubmit the revised application for approval, including all attachments, prior to initiating any buffer disturbance activities. In addition, all buffer disturbance and mitigation activities must be completed by <DEADLINE FOR COMPLETION OFF APPLICATION FORM>. Contact <INSPECTOR'S NAME> immediately upon completion to schedule a compliance inspection.

<INCLUDE THE FOLLOWING PARAGRAPH IF THE MITIGATION OPTION REQUIRES THE SUBMITTAL OF ADDITIONAL INFORMATION PRIOR TO CLOSER AS DESCRIBED IN SECTION 5.4 OF THE CHARLOTTE-MECKLENBURG WATER QUALITY BUFFER IMPLEMENTATION GUIDELINES>

The following must be submitted to <INSPECTOR'S NAME> at <INSPECTOR'S ADDRESS> by the deadline indicated above in order for the buffer disturbance and mitigation to be considered for final approval:

- <LIST ADDITIONAL REQUIREMENTS SUCH AS RECORDED DEED, ETC.>
-
-

You are responsible for ensuring proper erosion control to prevent sediment from entering surface waters during the performance of all activities related to this approved water quality buffer disturbance. In addition, you are prohibited from bringing fill or spoil material into the buffer.

Please be aware that it is the property owner's responsibility to maintain all mitigation measures in perpetuity. In addition, you are responsible for maintaining the measures necessary to ensure the diffuse flow of storm water runoff through the buffer. CMSWS will conduct periodic inspections to ensure compliance and the property owner will be immediately notified of all deficiencies for the initiation of the necessary corrective measures.

Failure to comply with the above requirements constitutes a violation of the <NAME OF ORDINANCE> which will subject you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day of noncompliance constitutes a separate violation. You are hereby directed to correct these deficiencies by <COMPLIANCE DEADLINE>. You will be notified if penalties are assessed.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services

**Appendix 32: Notification of Disapproval of Water Quality Buffer Mitigation Activities
Performed for a Proposed Buffer Disturbance**

<DATE>

<ADDRESS>

Re: Disapproval of Mitigation for Water Quality Buffer Disturbance
Authorization Certificate # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed an inspection of the water quality buffer disturbance and mitigation measures implemented at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. Based on this inspection, CMSWS has determined that the buffer disturbance and/or mitigation measures have not been satisfactorily completed in accordance with the approved Authorization Certificate as specified below:

- <LIST DEFICIENCIES>
-
-

Please be aware that the above deficiencies constitute a violation of the <NAME OF ORDINANCE> which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day the deficiencies remain unresolved constitutes a separate violation. You are hereby directed to correct these deficiencies by <COMPLIANCE DEADLINE>. You will be notified if penalties are assessed.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

Charlotte-Mecklenburg Storm Water Services





**Appendix 33: Notification of Approval of Water Quality Buffer Mitigation Activities
Performed for a Proposed Buffer Disturbance**

<DATE>

<ADDRESS>

Re: Approval of Mitigation for Water Quality Buffer Disturbance
Authorization Certificate # <SPECIFY ASSIGNED NUMBER>
<ADDRESS OF PROPOSED BUFFER DISTURBANCE>

Dear :

Charlotte-Mecklenburg Storm Water Services (CMSWS) has completed an inspection of the water quality buffer disturbance and mitigation measures implemented at <ADDRESS OF PROPOSED BUFFER DISTURBANCE>. Based on this inspection, CMSWS has determined that the buffer disturbance and/or mitigation measures have been satisfactorily completed in accordance with the approved Authorization Certificate # <SPECIFY ASSIGNED NUMBER>.

Please be aware that the mitigation measure must be maintained in perpetuity by the property owner, including the following:

- <INSERT ONGOING MAINTENANCE REQUIREMENTS SPECIFIED IN SECTION 5.4 OF THE CHARLOTTE-MECKLENBURG WATER QUALITY BUFFER IMPLEMENTATION GUIDELINES INCLUDING REPLACING DEAD VEGETATION, ANNUAL INSPECTION REPORTS FOR BMPS, ETC.>
-

Please be aware that the failure to maintain mitigation measures in perpetuity as described above constitutes a violation of the <NAME OF ORDINANCE> which subjects you to a maximum penalty of <MAXIMUM AMOUNT OF PENALTY> per violation. Each day the deficiencies remain unresolved constitutes a separate violation. Regular inspections of the mitigation measure will be conducted by CMSWS staff to ensure compliance. You will be notified in writing of any violations.

If you have any questions, please do not hesitate to call <INSPECTOR'S NAME> at <INSPECTOR'S PHONE NUMBER>.

Thank you.

Sincerely,

<INSPECTOR'S NAME>

<INSPECTOR'S TITLE>

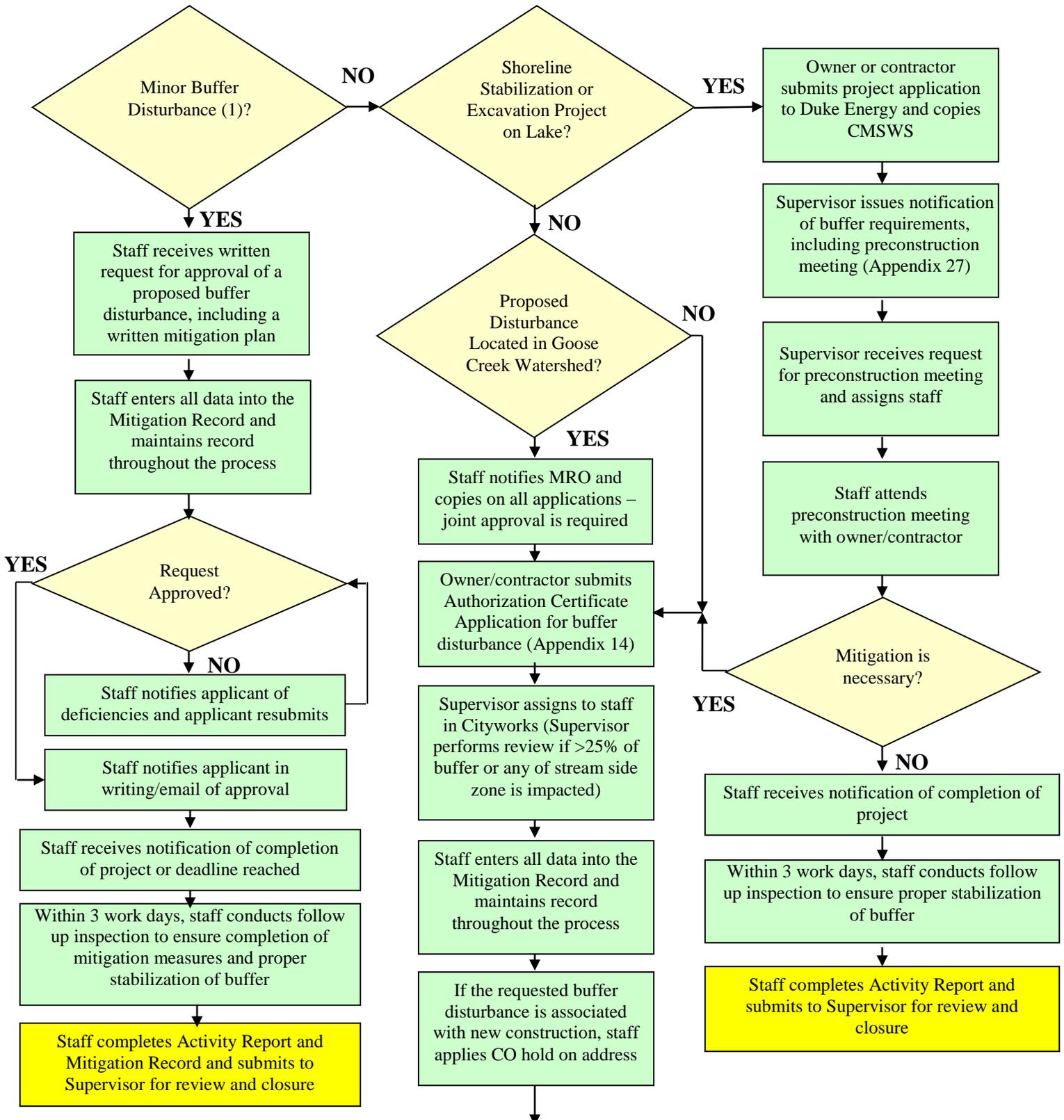
Charlotte-Mecklenburg Storm Water Services





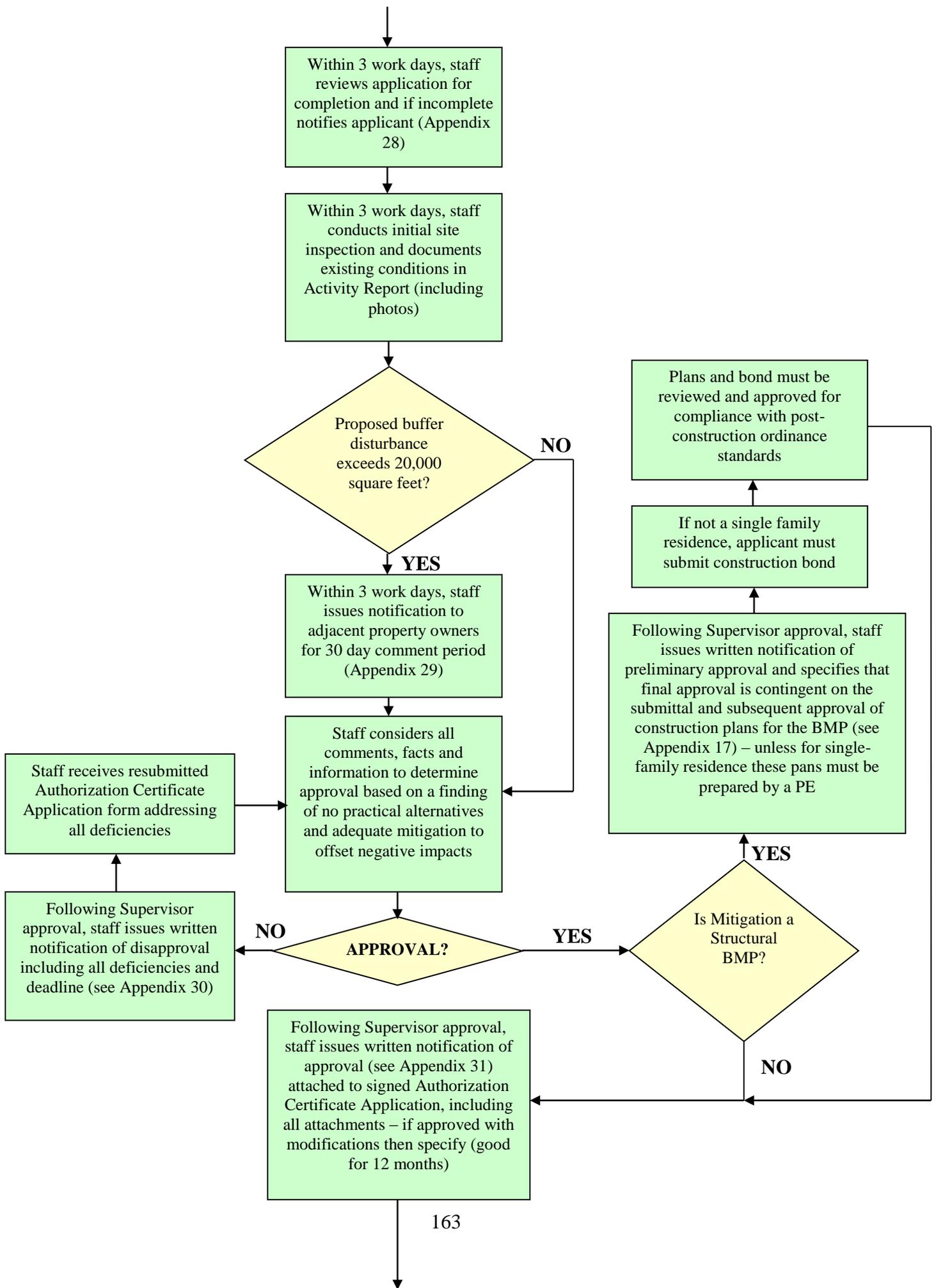
Appendix 34: Review Process for a Proposed Water Quality Buffer Disturbance

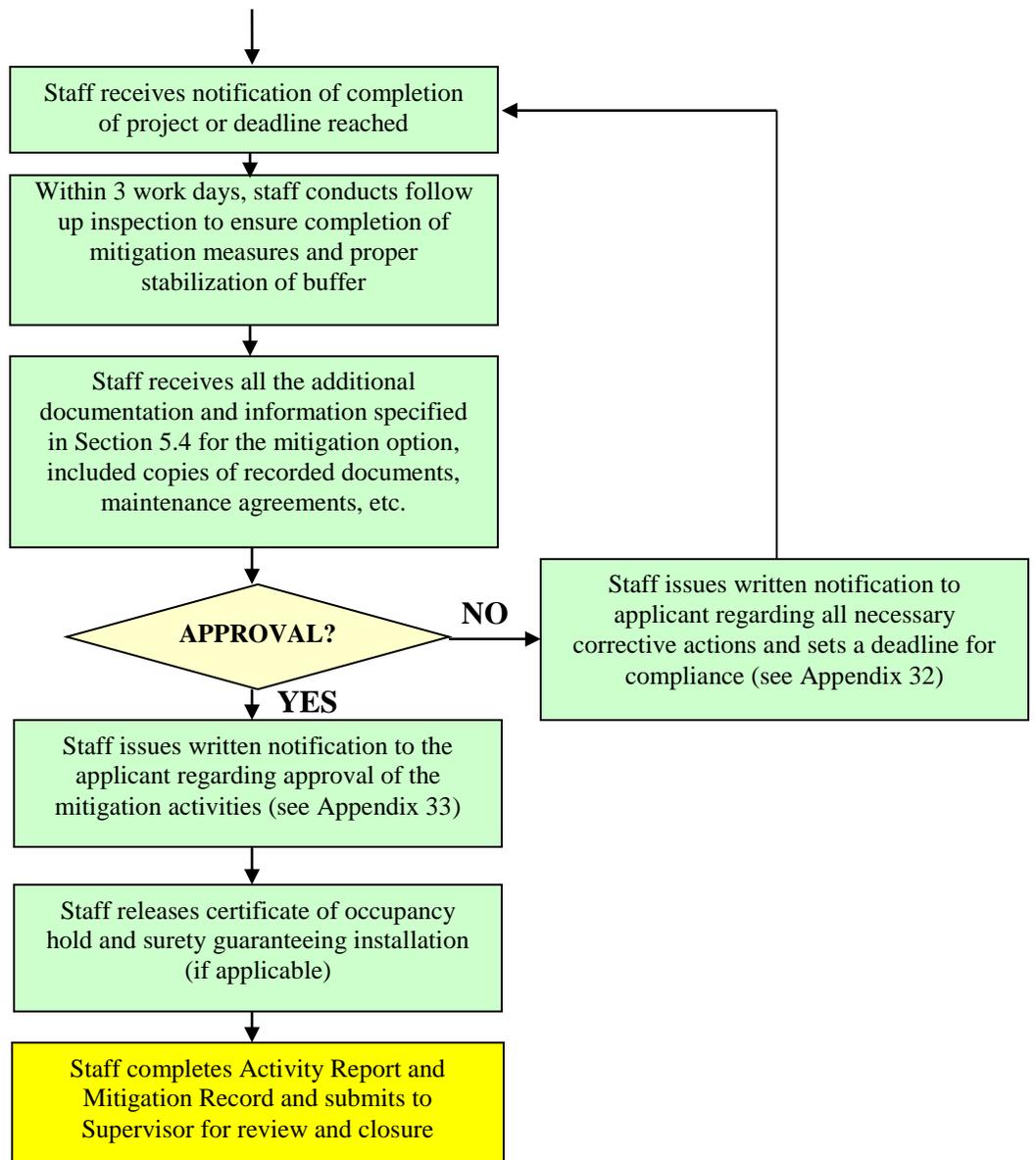
Review Process for a Proposed Water Quality Buffer Disturbance



1. Minor Buffer Disturbances include the following:

- S.W.I.M. and post-construction buffers where the disturbed area includes less than 100 square feet of the upland and/or managed use zones.
- Goose, Six Mile and water supply watershed buffers where the disturbance includes the removal of a small number of trees (usually less than 5) to accomplish a permitted activity such as shoreline stabilization or stream restoration or the removal of a small number of trees (usually less than 3) to eliminate a threat to structures and/or public safety.

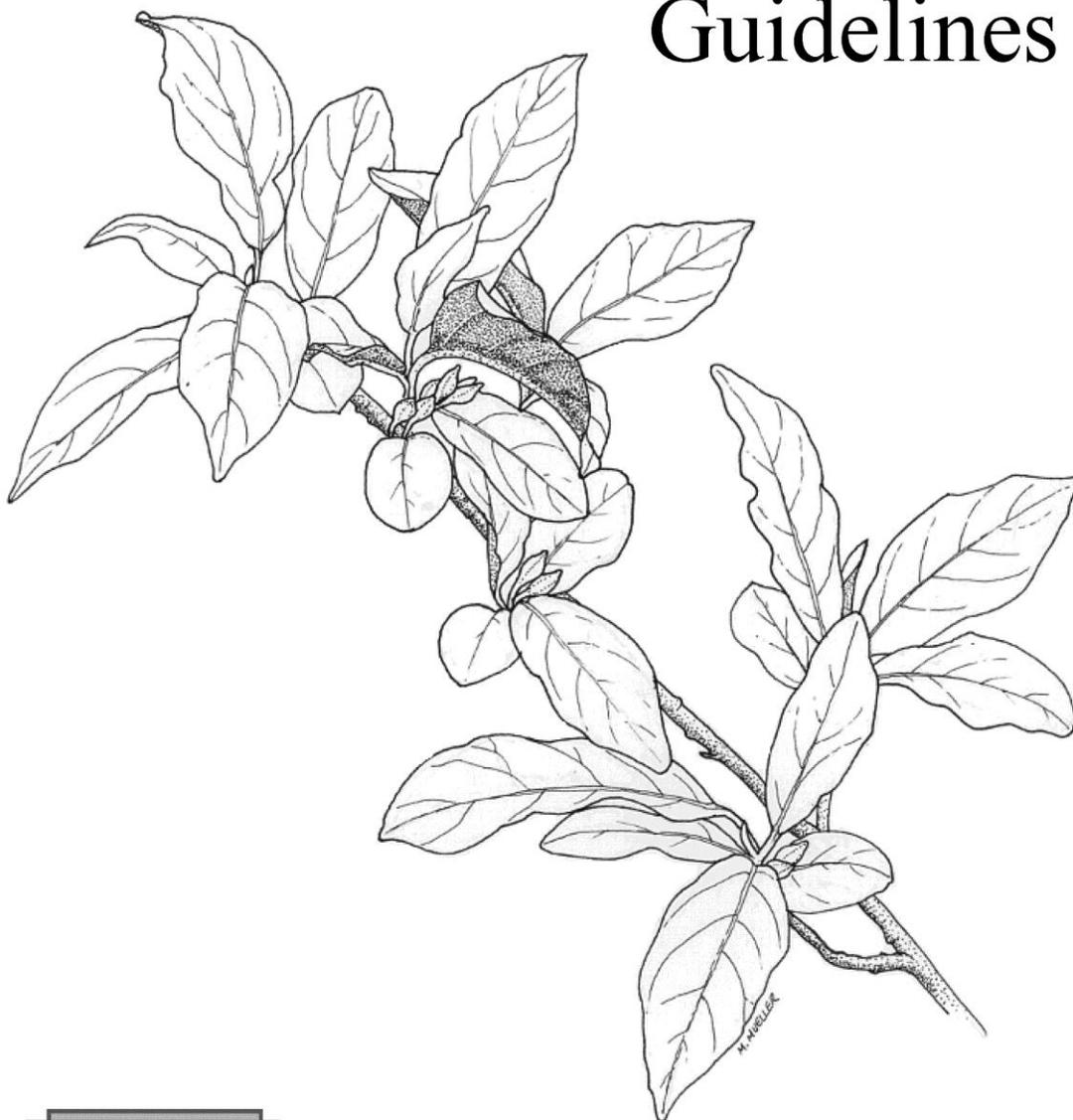






Appendix 35: Exotic Plant Guidelines

Exotic Plant Guidelines



North Carolina Division of Parks and Recreation
Department of Environment and Natural Resources

EXOTIC PLANT GUIDELINES

Cherri L. Smith
Department of Environment and Natural Resources
Division of Parks and Recreation

ACKNOWLEDGEMENTS

These guidelines would not be possible without the work of Dr. Robert W. Merriam, The North Carolina Nature Conservancy, and Dr. John M. Randall, The Nature Conservancy. Dr. Merriam's manual, Major Weed Pests of North Carolina, provided a wealth of information on a number of exotic plant species. Much of the information on herbicides and specifics for control plans in these guidelines came directly from the work of Dr. Randall. Thanks also go to the many other reviewers who took the time necessary to read the draft manuscript and to offer comments and suggestions.

I also greatly appreciate the illustrations drawn by Margret Mueller, a professional artist, as well as the illustrations drawn by Clare Steece-Julich and Alex Krings.

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Guideline: 30	Title:	Section: <u>1.0</u>
Originator: <u>Smith</u>	<u>EXOTIC PLANTS</u>	Page: <u>1 of 1</u>
		Date: <u>February 1, 1998</u>

1.0 DIRECTOR'S STATEMENT

As North Carolina continues to urbanize, our state parks become an even more important component of our landscape. Activities beyond park borders, however, are increasingly affecting natural resources and processes within our boundaries. In recent years, the introduction and spread of exotic plants has accelerated nationwide with North Carolina as no exception to the trend. Active control of exotic plants within the parks is becoming more and more critical to protect the integrity of the native biological communities of our parks.

Exotic plants have been introduced, either intentionally or by accident, into areas outside their native range. Although most of these exotic species have little or no impact, and in many cases are highly beneficial, a small percentage are potentially devastating to the natural resources of our state parks. As park resource managers, it is our mission to protect our native plants, animals, and biological communities by actively working to prevent the introduction and spread of invasive plant species within our borders.

The intent of the following Exotic Plant Guidelines is to provide technical information for the successful control of invasive exotic plant species. This document also outlines a systematic methodology for determining the priority of exotic plant problems and documenting control efforts. The initiation of actions to manage infestations of exotic plants will be in accordance with these guidelines.

Sincerely,

Philip K. McKnelly
Director

Guideline: 30	Title:	Section: <u>2.0</u>
Originator: <u>Smith</u>	<u>EXOTIC PLANTS</u>	Page: <u>1 of 1</u>
		Date: <u>February 1, 1998</u>

2.0 INTRODUCTION AND POLICY STATEMENT

Of the thousands of species of exotic plants that are established in the United States, only a small percentage ultimately cause problems. This small percentage of plants, however, can wreak havoc as they spread into surrounding ecosystems and displace native vegetation. Exotic plant species often outcompete native species because they are aggressive in their growth habits, put out more seed that lasts longer in the soil, or have no natural predators and diseases in the ecosystem that they are invading.

The control of exotic plant species is an important component of natural resource management in the state parks system. At this point, it is necessary for us to intervene since exotic plants have disrupted natural processes in a number of our parks. In many cases, the continued existence and spread of exotic plant species pose a threat to our rare native plants, animals, and biological communities as well as to important archaeological sites.

It is, therefore, the policy of the North Carolina state parks system to control the spread of exotic plant species where feasible. Our first line of defense should always be to prevent the introduction of these undesirable species into our park boundaries. Where prevention is no longer an option, active control measures may be pursued. Implementation of control measures will be preceded by a control plan and followed by a monitoring program.

The following information outlines a strategy for the overall priority, management, and control of exotic plant species in North Carolina's state parks system. Appendix I presents the specific requirements for a management and control plan and Appendix II outlines an example management and control plan. Appendix III presents fact sheets covering how to identify and control the 14 most invasive exotic plant species found in our state parks. Appendices IV through VI cover North Carolina's Aquatic Weed Control Act of 1991, State Noxious Weed List, and Regulations for State Noxious Weeds.

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3.0 DEFINITIONS

Exotic species: A species occurring in a given place that is outside of its native range. Exotic, non-native, non-indigenous, introduced, and alien are synonymous terms. The vast majority of exotic species have little or no impact on our natural areas, and many are highly beneficial. Almost all of our important crops are exotic species that were deliberately introduced.

Invasive exotic species: A species outside of its native range that threatens the survival or reproduction of native plants or animals or threatens to reduce biological diversity. Invasive exotic species will be considered for active control in our state parks.

Historic cultivars: Varieties of domestic, ornamental, or crop plants that may be genetically or morphologically distinct from the common contemporary varieties, were present in historic districts during periods of significance, and have been used historically.

Native species: A species that occurs and evolves naturally without human intervention or manipulation.

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4.0 PREVENTION OF INVASION

The first line of defense in the management of exotic species is to **prevent** their introduction and establishment. **The importance of prevention cannot be overemphasized.** The following methods are useful to help prevent accidental introductions:

- 1) minimize the building of roads, trails, and structures that break up intact native communities. Also, locate facilities to minimize disturbance and fragmentation;
- 2) watch existing disturbed areas for invading species;
- 3) minimize changes in hydrology as well as erosion and sedimentation. These changes tend to degrade native plant communities, allowing more easy access for exotic plants;
- 4) ensure fill used in construction projects and other materials likely to transport exotics are as free as possible of exotic plant propagules; and
- 5) where feasible, control exotic plant species established on neighboring lands before they become established on the park.

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5.0 ASSESSMENT OF EXOTIC PLANTS IN A PARK

An assessment of exotic species problems will eventually be conducted for each park. The assessment will include an inventory of exotic species and an evaluation of the priority of each species for control efforts.

In order to do this inventory, park managers should eventually be able to recognize the exotic plant species within their parks. In some cases, park staff will be able to do this inventory on their own and, in other cases, it may be necessary for the division to hire a consultant or researcher to assist with this job. The inventory should thoroughly document the population size, extent, and effects on natural and cultural resources of each exotic plant species.

The following criteria that will be used to determine the priority of each species for control efforts include: the immediacy of the threat to an area of ecological or cultural significance, the likelihood of success of the control effort, and the invasiveness of the exotic species. The following categories are outlined by priority for control:

5.1 Priority by Immediacy of Threat

High priority where exotic species pose immediate threat to:

- rare or endangered native plants or biological communities;
- undisturbed examples of natural communities;
- biological communities representative of North Carolina's natural landscape that are not represented elsewhere in the state parks system;
- areas supporting species of animals known to depend upon native vegetation that is threatened by exotic species; and
- the integrity of a historic or culturally significant site.

Medium priority where exotic species will threaten an area as described above within 1-2 years.

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Low priority where it will be more than two years before an exotic species poses a threat to an area as described above.

5.2 **Priority by Likelihood of Success**

High priority where invading species is present in localized populations with good possibility for eradication.

Medium priority where invading species is controllable but only in selected areas or confinable to certain areas of the park. This category also includes species that are controllable parkwide, even though this effort may require removal from one area at a time.

Low priority where invading species is present with little possibility of control.

Localized exotic plants are the most amenable to control efforts. It may even be possible to completely eradicate these species if management is initiated quickly. Since exotic plant species often establish along predictable avenues such as roadsides and other areas where disturbance has taken place, efforts to assess the invasion of

exotic plants should be concentrated in these areas. Exotic plant species that have become established in the park may not be controllable throughout their entire range, but their impacts can be ameliorated. One method is to control these species in selected areas. These areas should include high priority natural areas and culturally significant sites. Another approach is to confine widespread exotic species to certain portions of a park. This approach works by controlling an infestation at the edges and then working toward the center. With this approach, surveys should be conducted beyond the controlled area to assure that long-distance establishment has not taken place.

Some widespread populations of exotic species cannot be controlled or can be controlled only partially. In these cases, their impacts must be accepted and every effort should be made to control further spreading.

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5.3 Priority by Invasiveness of Species

High priority for highly invasive species. These species may include but are not limited to:

tree-of-heaven (*Ailanthus altissima*)
autumn olive (*Elaeagnus umbellata*)
hydrilla (*Hydrilla verticillata*)
Korean lespedeza (*Lespedeza cuneata*)
Chinese privet (*Ligustrum sinense*)
Japanese honeysuckle (*Lonicera japonica*)
purple loosestrife (*Lythrum salicaria*)
Japanese grass (*Microstegium viminium*)
princess tree (*Paulownia tomentosa*)
common reed (*Phragmites australis*)
kudzu (*Pueraria lobata*)
multiflora rose (*Rosa multiflora*)
Johnson grass (*Sorghum halepense*)
alligatorweed (*Alternanthera philoxeroides*)

Low priority for moderately invasive species. These species may include but are not limited to:

mimosa (*Albizia julibrissin*)
gill-over-the-ground or ground ivy (*Glechoma hederacea*)
English ivy (*Hedera helix*)
common chickweed (*Stellaria media*)
bigleaf periwinkle (*Vinca major*)
common periwinkle (*Vinca minor*)
wisteria (*Wisteria sinensis*)

Each park's list of exotic species should be divided into these two categories of invasiveness to help prioritize where action should be taken. Those species with more potential to harm park resources should be given higher priority for control. Innocuous exotic species such as those restricted to areas subject to continuing human disturbance (i.e. continuously disturbed lawns and roadsides) are not

discussed in this section since management efforts should generally not be expended

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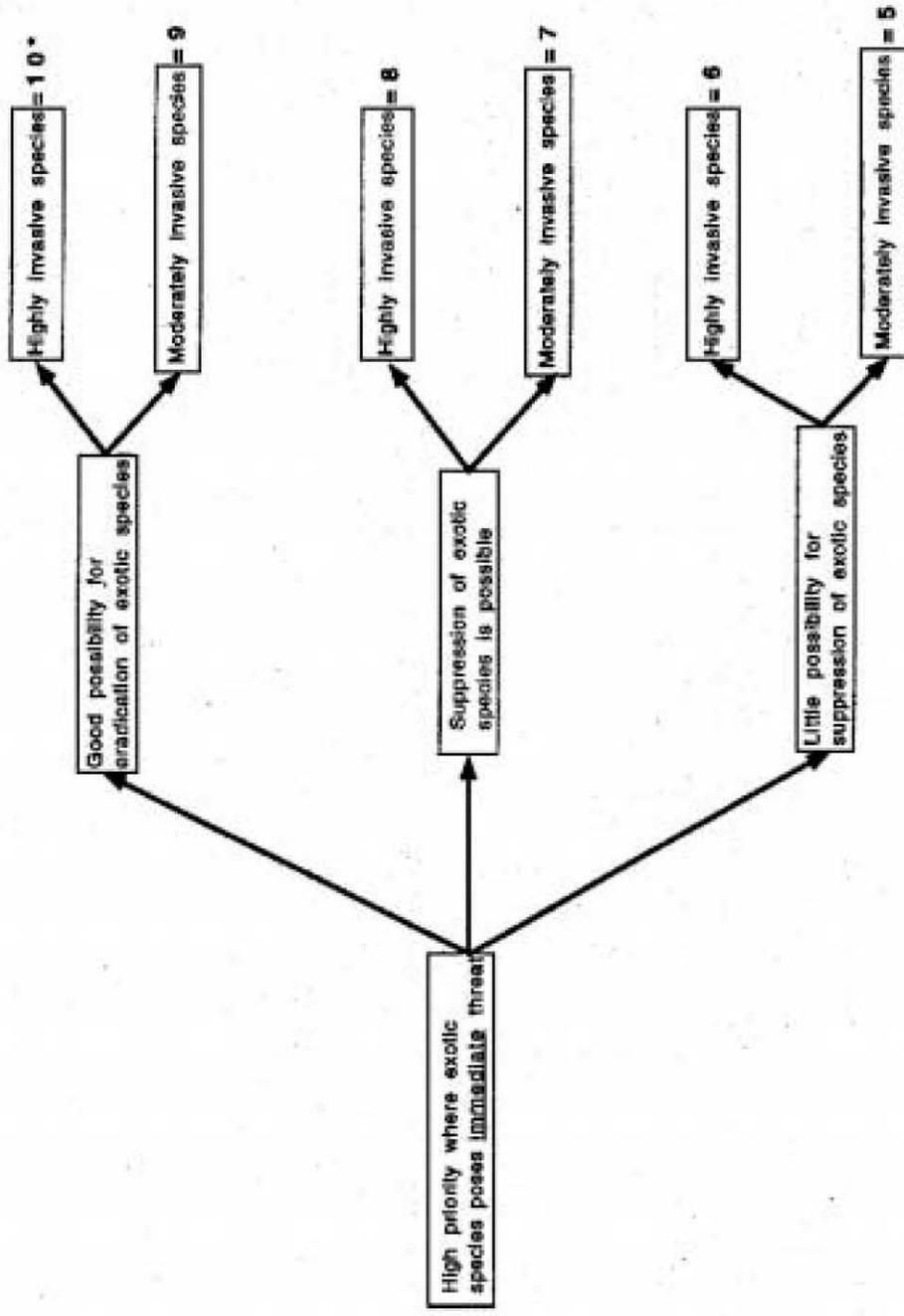
on these species. For the purposes of these guidelines, highly invasive exotic species are defined as those plants that have species, community-level, or ecosystem-level effects that can significantly alter natural processes such as fire regimes, nutrient cycling, hydrology, or successional patterns. These plants may also alter species composition by reducing populations of native species or by hybridizing with native species. Moderately invasive exotic species are those species that tend to spread slowly and stay in localized patches. They do not often pose a threat of becoming landscape-level problems. These species can, however, pose problems for small populations of rare plants.

5.4 Flow Charts

These three criteria are combined into a series of flow charts in Figures 1a.-1c. These flow charts and corresponding scores of 1-10 are designed to provide park managers with guidance on when an exotic plant is an overall high, medium, or low priority for control. An overall score of 8-10, 4-7, and 1-3 indicates a high, medium, and low priority for control, respectively. Since these scores are meant as guidance, they should not in all cases replace best professional judgement. Each park's list of exotic plant species should eventually be prioritized based on the criteria set forth in these flow charts. Refer to Table 1 for an example of how to organize these data.

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FIGURE 1a. Method to Prioritize for Control of Exotic Plant Species

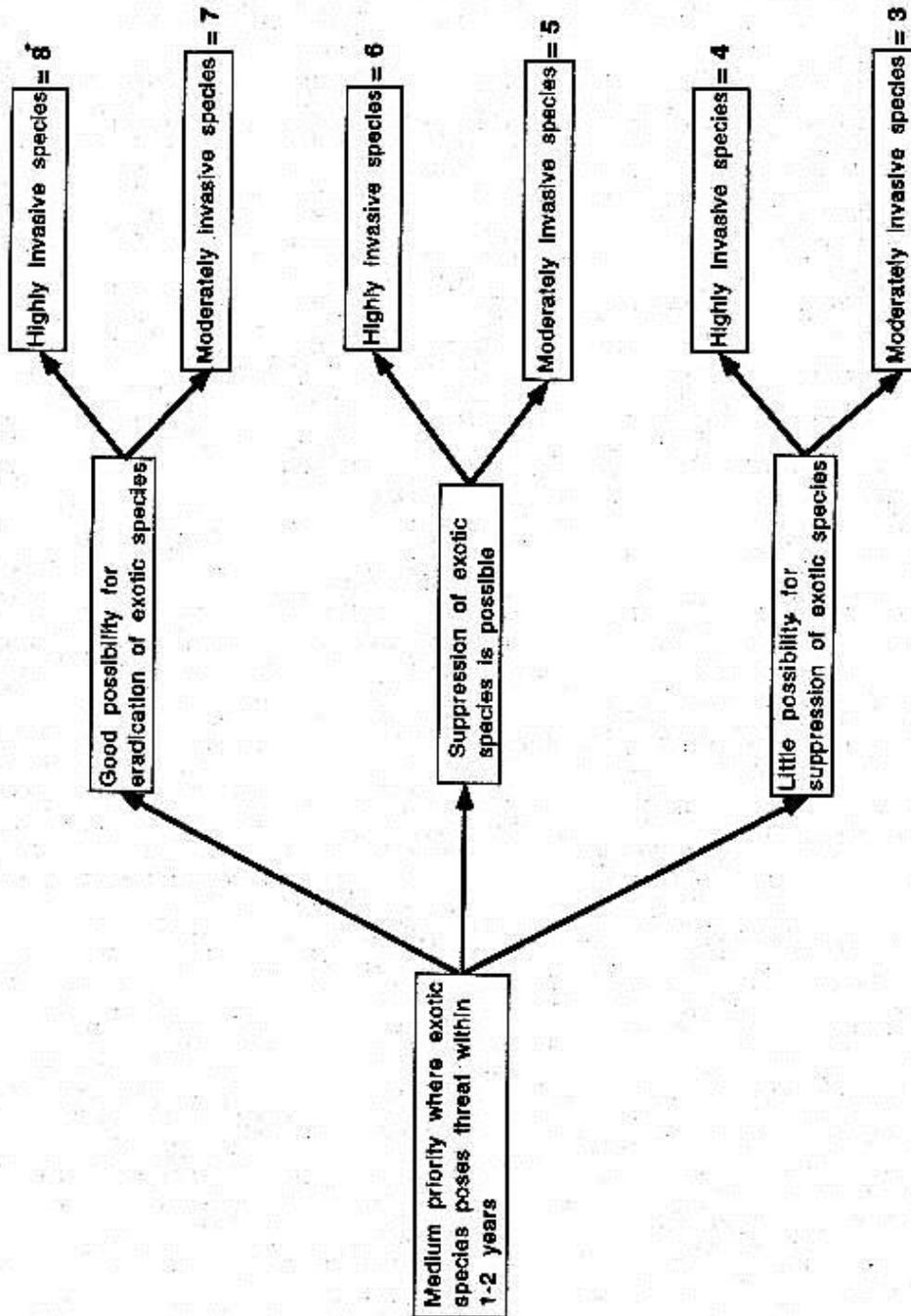


* 8-10=high priority for control; 4-7=medium priority for control; 1-3=low priority for control

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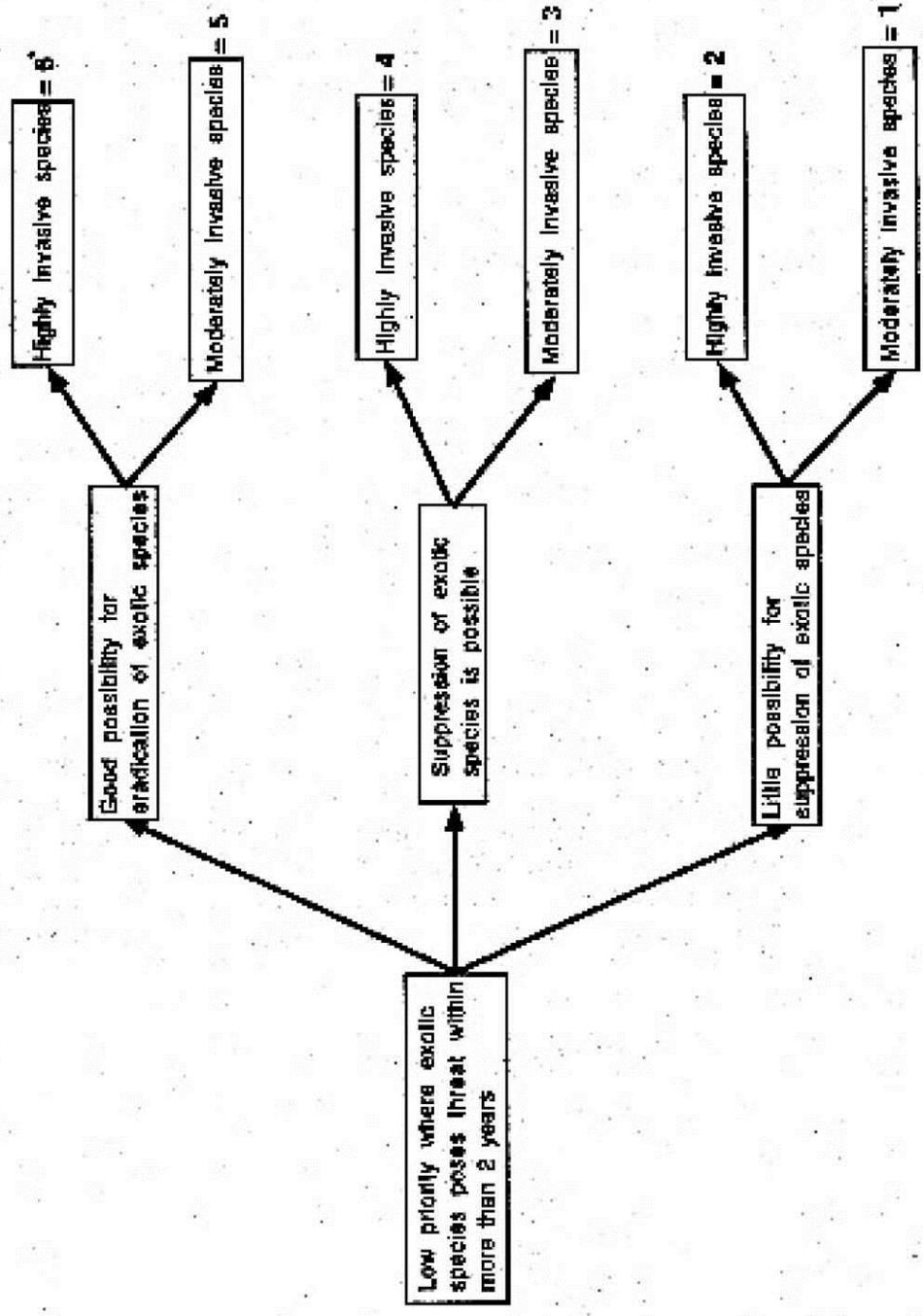
FIGURE 1b. Method to Prioritize for Control of Exotic Plant Species



* 8-10=high priority for control; 4-7=medium priority for control; 1-3=low priority for control

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FIGURE 1c. Method to Prioritize for Control of Exotic Plant Species



• 8-10=high priority for control; 4-7=medium priority for control; 1-3=low priority for control

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Table 1. Prioritized List of Weed Species

Last Updated:

<u>Common Name</u>	<u>Scientific Name</u>	<u>Score/Category</u>	<u>Comments</u>

5.5

Staff Time

The initiation of an effort to control exotic species will obviously require staff time. Small infestations of exotic plants will likely be controllable by on-site park staff, whereas more widespread, established exotic plant problems may require a much greater commitment of time than is available within the individual park. High priority infestations for control, however, should not be neglected because of lack of staff. If additional staff time is needed for control of a high priority problem, the park superintendent may request assistance from elsewhere in the organization. Parks are encouraged to share expertise and to help each other with staff if possible. Parks may also use volunteer assistance for efforts to control exotic species if appropriate.

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6.0 PLANNING FOR CONTROL OF EXOTIC SPECIES

6.1 Preparation of a Control Plan

The importance of controlling exotic pests is recognized nationwide. Efforts are underway in North Carolina to control exotic plants at the federal, state, and local levels as well as by private organizations such as The Nature Conservancy. Any information that we gain in the state park system toward the goal of successful control of exotic plants will be valuable to other land managers with similar problems. Control plans are particularly important as a method of documenting the success or failure of various treatments for use by our own as well as other agencies.

An Exotic Species Control Plan will be prepared and approved before a major control effort is initiated. The plan will include a thorough inventory, the priority status for active control, locational maps, goals for control, description of selected control method(s), and a monitoring program for the problem species. Generally, control efforts will be initiated through park staff with resource management staff available for technical assistance.

In addition to eliminating a species that may be threatening a natural or cultural resource, a control plan must also focus on what should be in place of the exotic species. A program for the control of exotic species is best viewed as part of an overall restoration program. The control program also must consider what impact control operations will have on other indigenous species.

Long-term and sometimes even permanent management commitments and consistent follow-up are essential to successful programs for controlling exotic plants. Persistent seed banks and long-lived seeds often require control efforts over many years to eradicate exotic plants in a park even if the species are localized. For these reasons, plans should be developed for a specific period (e.g. 5 years) and be flexible enough to be modified if new circumstances arise. These plans should include schedules for achieving goals as well as estimates of required materials, money, and person-hours. Goals should consider the level of control desired and practically attainable. Eradication of the exotic species is ideal, but in many cases it may be impossible to achieve. Generally, the goal will be to reduce the population to some stable level. **Refer to Appendix I for an example of a control plan for exotic plant species.**

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6.2 When NOT to Write a Control Plan

Control plans are not necessary for the management of every exotic plant species in a park. Clear-cut situations where control plans are not necessary include the routine spraying of glyphosate around buildings to control weeds, removal of a few exotic shrubs at an old homesite, or pulling up English ivy at a ranger residence. As stated previously, at the other extreme are long-term or sometimes even permanent management commitments involving considerable money and staff time. Of course, there will always be a number of situations that fall somewhere in between the two extremes. When in doubt about whether an exotic species problem warrants a control plan, please call the division's resource management staff for advice.

6.3 Who Writes a Control Plan

Park staff may choose to write their own control plan or they may request that resource management staff write the control plan for them. In the latter case, park staff should schedule an on site field investigation with a representative from the Resource Management Program.

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7.0 MANAGEMENT OF HISTORIC CULTIVARS

In cultural landscapes, exotic plants should be evaluated according to their cultural and/or historical significance. Both cultivated and noncultivated species may be appropriate in a historical context. In fact, native plants and animals may require management if they are detrimental to the management of cultural landscapes.

If historic cultivars occur within a natural area and they are not invasive, they may be left in place. If removal is chosen, the park should provide propagules from the historic cultivars to botanical gardens, arboretums, and other interested public or nonprofit organizations. In historic areas, disruptive exotic plants may be replaced with cultivars, crop land, or pasture as well as by native plant communities which are historically appropriate. This activity requires an approved control plan.

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8.0 TREATMENT OF EXOTIC PLANTS

A number of factors need to be considered when choosing a method of eradication or control. These factors include: potential impact to non-target organisms; risks to workers, volunteers, and visitors; effectiveness; cost per unit of control; public relations; and impacts to public use areas. The various methods of control available may be classed under the headings: manual/mechanical, prescribed fire, competition/restoration, flooding, biological control, chemicals (herbicides), and integrated pest management. This list does not preclude other methods of control where appropriate.

8.1 Manual/Mechanical Control

Some weeds can be controlled by pulling them by hand or removing or killing them with a tool or mechanical device. A major advantage of manual/mechanical methods is that they can be safely used by staff and volunteers. On the other hand, these methods do not kill the wide variety of species (particularly shrubs) that resprout vigorously. Disturbance to the soil can also encourage reinvasion and incursions by other pests.

8.2 Prescribed Fire

The majority of park managers are familiar with the use of fire to manage vegetation communities that have evolved with fire. In this case, fire is used primarily to manage the growth of species that are native. Fire may also be used to control exotic species. Prescribed fires, however, should be used with caution since they may actually promote certain invasive, non-native species.

8.3 Competition/Restoration

The use of native plants to outcompete alien weeds is a frequently overlooked but potentially powerful technique. Often the natives must be planted into the habitat and given some care until they are well established. This technique may be appropriate where a native forest community is to be re-established in an old field that currently has an herb layer dominated by exotic grasses and forbs. Other weed control methods can be enhanced by encouraging competition from native species. Lightly infested patches or satellite populations of exotic plants can be cleared manually or with spot-treatments of herbicides, clearing the way for the

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re-establishment of native species. Once lightly infested patches or satellite populations have been cleared, the core infestation can be attacked by gradually clearing the perimeter and encouraging natives to move in.

8.4 Flooding

Prolonged flooding can kill plants that infest impoundments or other areas where water levels can be controlled. This method works best if the area is mowed or burned prior to flooding. For example, part of a *Phragmites australis* infestation at the Wertheim National Wildlife Refuge on Long Island, NY was eliminated by prescribed burning followed by flooding.

8.5 Biological Control

Biological control, or biocontrol, involves the use of animals, fungi, or other microbes that prey upon, consume, or parasitize a target species. “Classical” biological control carefully selects and introduces one or more of these enemies to the target species’ new habitat to reduce its population. Successful “classical” biological control programs result in permanent establishment of the control agent(s) and consequent permanent reduction in target species populations. Results cannot be expected immediately from this type control. “Inundative” or “augmentative” biological control involves mass releases of native or non-native organisms.

Biological control is not designed to eliminate the target completely, and it often takes years before the effects are obvious. Moreover, agents for biological control are available for only a few exotic plant species, and the research required to locate and test potential biological control agents is beyond the individual capabilities of the parks. For these reasons, biological control will at present have little utility for the majority of exotic plant problems.

8.6 Chemicals (Herbicides)

Herbicides are chemicals that kill or inhibit plant growth. Herbicides are frequently needed in exotic plant programs because they can be extremely effective tools in controlling or eliminating certain exotic plant species. They can also, however, be hazardous to human beings and the environment and should be used only after careful consideration of other options.

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8.7 Integrated Pest Management

In most cases, no single method of control is completely effective against an exotic species. Several considerations must be made when selecting pest management strategies. Consideration must be given to disruption of natural controls, hazards to human health, effects on nontarget organisms, overall damage to the environment, how effective treatments will be in reducing the pest population below the action level, how feasible it will be to effectively implement treatments, and how cost effective the treatment is over the short and long term. The integrated pest management concept is based on the fact that combined strategies for pest management are usually more effective in the long run than a single type of treatment.

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9.0 **PROTOCOL FOR USING HERBICIDES**

9.1 **Choosing an Herbicide**

When deciding which herbicide to use, consider the following factors:

- effectiveness on the target species;
- effects on non-target species;
- persistence in the soil;
- toxicity to animals; and
- likelihood that it will leach to groundwater.

Look for chemicals that:

- are selective;
- degrade rapidly;
- attach to soil particles and, therefore, are less likely to reach groundwater; and
- are non-toxic to animals.

In some cases the most effective herbicides are also more persistent and toxic. More effective herbicides, however, may not require repeated application and may result in the smallest total input of toxin to the environment. Trade-offs between effectiveness and toxicity will need to be evaluated on a case-by-case basis within an individual management plan.

Site conditions are also important to consider when choosing a control method. These conditions include: accessibility, proximity to open water, depth to groundwater, and the presence of rare species.

9.2 **Choosing an Application Method**

Herbicides can be applied:

- to living foliage;
- around the circumference of the trunk on the intact bark;

- to cuts in the stem;

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- by injection into the inner bark;
- to cut stems and stumps;
- in pellet form at the base of the plant; and
- to the soil before pest seeds germinate and emerge.

Application techniques that minimize the release of the herbicide to the environment are preferred, especially if other rare species are in the vicinity. This choice will depend greatly on the species being eradicated as well as the herbicide that is used. Use of a marker dye with foliar-applied herbicides will aid in avoiding non-target vegetation and will facilitate better coverage on the target weeds.

Park employees **must be licensed** by the North Carolina Department of Agriculture for any pesticide use on public lands. Training and exams are offered periodically in various locations throughout the state. Staff should contact Pesticide Education, 51 Kilgore Hall, N.C. State University, Raleigh, NC 27695, (919)-515-3113 for information regarding training.

9.3 General Safety Considerations

The health and safety of the applicator is always of utmost importance. Weed control management plans involving the use of herbicides should include protocols for safety that contain procedures for chemical storage, mixing, and cleanup. The following outlines some general guidelines that should be adhered to when using herbicides.

9.3.1 Protective gear

At a minimum, applicators must wear all protective gear required on the label of the herbicide they are using. Even if not required, the applicator should wear the following when mixing or applying herbicides:

- rubber boots
- long sleeved shirt and long pants (unless more protective clothing is required on the label such as a tyvek suit)
- rubber gloves (these should not be fleece lined)
- safety goggles

- respirator or dust mask if required on the label

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9.3.2 **Emergency precautions and equipment**

It is important for applicators to be supplied with decontamination and first aid kits whenever they do not have easy access to a shower or sink. Decontamination kits should include:

- two one gallon or more containers filled with potable water
- eyewash kits or eyewash bottles with buffered isotonic eyewash
- soap
- paper towels
- a map and directions to the nearest medical facilities and emergency phone numbers
- a full tyvek coverall with foot covers

9.3.3 **Posting treated areas**

The herbicide label will list any federal requirements for posting treated areas. Most of the more commonly used herbicides such as glyphosate and triclopyr have no federal posting requirements. Treated areas should always be kept off limits to the public at least until the herbicide dries and longer depending on the persistence of the herbicide.

When posting areas accessible to the public such as trails and visitor centers, place notices on the usual points of entry or the perimeter of the treated sites. The posting should include a notice that the area has or will be treated, the name of the herbicide used, the date of treatment, appropriate precautions to be taken, the date when re-entry is determined to be safe, and a phone number for additional information.

9.3.4 **Storing herbicides**

Always store herbicides in a well ventilated, cool, dry area where food and drinks are not stored or prepared. Always store herbicides in their original containers. The floor should be concrete or lined with plastic or other impermeable material to prevent leaks from reaching the soil. The storage area should also be inaccessible to the public and locked except when chemicals are being removed or returned. Containers should be labelled with the contents, date mixed, and approximate remaining volume. Containers must never be stacked.

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9.3.5 Mixing herbicides

Although it may seem obvious, **read the label** before mixing any herbicides. Water used for mixing in the field should be in separate containers labelled “Water and Rinsate for Herbicide Only, Nonpotable.” Always keep the water and rinsate containers separate. The rinsate should not go into the water container. Certain areas should be designated for the mixing of chemicals such as near the storage site or in areas near the treatment site. Field mixing sites should have relatively few native species that could be impacted, be in areas that are not susceptible to runoff or erosion, and be isolated from areas that are visited by the public. Rinse small spills to a safer dilution and always take a shovel, heavy plastic garbage bags, and a soil absorbent (eg. cat litter) to field mixing sites in case of a larger spill. Never mix herbicides near a well and never fill a tank with the hose placed in the mixing tank.

9.3.6 Transporting herbicides

Herbicides must always be transported in a well constructed and watertight box or bucket to prevent leaks from contaminating vehicles, applicators, and the environment. Containers should never be placed in the passenger compartment of a vehicle for transportation.

9.3.7 Herbicide disposal

Equipment cleanup

Application equipment and empty herbicide containers must be triple rinsed following use with 10% of the container volume for each rinse. This waste water must then be applied to a target weed for proper disposal. It is best to pressure rinse the container directly into the spray tank. Always read the label for specific procedures for equipment cleanup.

Container disposal

Containers should always be punctured before disposal to prevent re-use and should be crushed if possible. Properly rinsed containers can be disposed of at most municipal and county landfills throughout the state. Since some counties may also have specific collection centers for recycling pesticide contaminated containers, applicators should check on the availability of these centers. If the

herbicide label states that the container may not be disposed of in a regular sanitary landfill, call your county or municipal waste department for information on avenues for proper

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disposal. For example, many counties have periodic dates for collection of hazardous materials.

9.3.8 Applicator cleanup

After cleaning all pesticide containers and application equipment, thoroughly rinse personal protection gear with cold water from a hose or container that is hand-held (gloves off) and was not used during application work. All personal protection gear should then be washed in mild soap and water. Finally, applicators should wash their hands and any other areas that were exposed and could have potentially come in contact with the herbicide. Applicators should also shower and change clothing as soon as possible. Even if clothes worn during the application appear uncontaminated, they must be washed and dried separately from other clothing before being worn again.

9.3.9 Contaminated clothing

If concentrated herbicide spills on clothing, the clothing should be wrapped in newspaper and placed in the trash or a landfill, or burned where permitted. Items contaminated with certain commercial products, including “2, 4-D” or formulation in which “2, 4-D” is the sole active ingredient, are classified as hazardous wastes. In this case, you should contact your local hazardous waste materials center for instructions on how to dispose of this material.

9.3.10 Responding to spills

The proper response to a spill varies depending on the volume and concentration of herbicide released, the location of the spill, and the chemical involved. In general, it is not necessary to call for help unless an herbicide spill contaminates too much soil to dig up and place in plastic garbage bags.

When small volumes of dilute herbicide are spilled, they can be treated by digging up the affected soil and spreading this material at the legal rate or concentration. This material should be spread on areas within the designated treatment site. In situations where a spill is so large that it cannot be readily contained or disposed

of please call 911 and ask for assistance from the local fire department. The fire department will generally have access to their own hazardous materials team and, if not, they should know who to contact at the local or county level.

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10.0 MONITORING TREATMENT AREAS

The Exotic Species Control Plan will include a program for monitoring the results of control efforts. The importance of monitoring the impact of a control plan on an exotic plant species cannot be overemphasized. Monitoring data should be taken before the initiation of a control program as well as on an annual basis to determine if and when additional treatment is necessary. Monitoring is also important to determine whether the treatment adversely affected other organisms.

To monitor trends in population growth and possible expansions of range, baseline data on the exotic species must first be obtained. These data should include a range map of the exotic species and information on the density of the population. Information on the ecological role of the exotic species is also needed to determine the urgency of control measures.

The use of photographic monitoring to evaluate changes in cover, density, or population structure is one of the most efficient methods of long-term monitoring, both in terms of cost and time. These guidelines do not preclude the use of other types of monitoring such as vegetation transects; however, only the protocol for photographic monitoring will be covered given the parks limited resources. **It is the responsibility of the park superintendent to ensure that control programs are adequately monitored.**

The two types of photographic monitoring covered by these guidelines include photopoints (repeated photographs of a landscape area) and photoplots (repeated photographs of a plot located at or near ground level). The following outlines the protocol that should be followed when using photographic monitoring.

10.1 Equipment

- A quality 35 mm camera with either a 35 mm (for wide angle shots) or a 50 mm macro lens (for normal shots) is recommended.
- Either black and white prints (film: Kodak T-Max 100) or Kodachrome slides are the best for archival purposes.

- A tripod is useful for repeating shots at the same location and height above the ground as well as providing greater stability while

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focusing.

- A pole with clearly marked units to measure the height of vegetation and to provide a scale in the photographs is recommended.

10.2 **Permanently Marked Point**

For photopoints and photoplots, the location from which the photograph is taken needs to be permanently marked. This step requires a permanent stake or marker (i.e. PVC, conduit, rebar).

10.3 **Data and Data Sheets**

Locational as well as photographic data should be taken at each photopoint or photoplot. A sample data sheet is found in Appendix I.

10.4 **Archiving Photographic Monitoring Data**

Slides and photographs should be stored in a dark, cool (no higher than 70° F), and dry (between 25-50 percent relative humidity) environment. Storage locations can be metal file or storage cabinets or archival storage boxes made of acid-free paper. Wooden storage cabinets should not be used since wood maintains higher humidities than are recommended. Slides/photographs should be stored in tight plastic sleeves for protection from handling and dust.

The duplication of slides and photographs is recommended for long-term projects. Duplicates of slides are usually made on Ektachrome film and will, therefore, not last as long as the Kodachrome originals. It is best to use the Ektachrome duplicates for projection and for use in the field and to archive the Kodachrome originals.

10.5 **Important Considerations for Establishing Photopoints**

- recommend keeping the vertical angle of the camera at 90 degrees
- take photographs with the sun directly behind or directly above

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10.6 **Important Considerations for Establishing Photoplots**

Photoplots can be used for qualitative assessments of change; however, they are most useful to obtain quantitative data on cover or density. The prerequisites for quantitative photoplots include:

- short-statured vegetation (usually less than 1.5 feet)
- identifiable species of interest in the photograph or slide
- a small enough plot size (1.5 x 1.5 feet at most) to be photographed by people of different heights

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11.0 ROLES AND RESPONSIBILITIES

11.1 Superintendent of State Parks

The Superintendent of State Parks is responsible for the administration of the Exotic Plant Guidelines.

11.2 Park Superintendents

Park superintendents are responsible for preventing the invasion of exotic plant species into park boundaries to the greatest extent possible. They are also responsible for the assessment and the establishment of priorities of the exotic plant problems in their parks as well as ensuring that every major control effort has a completed control plan. Staff at an individual park may prepare their own plan or the park superintendent may request that resource management staff write a plan for them. Park superintendents share joint responsibility with the supervisor of the Resource Management Program for final approval of all control plans for exotic plants in their respective parks.

11.3 Resource Management Program

Staff of the Resource Management Program are available to provide technical assistance in the prevention and assessment of exotic species problems. They are also available to write control plans as requested. The supervisor of this program shares with the park superintendents the responsibility for final approval of all control plans for exotic plants.

11.4 Public Information Officer

In the case of large-scale programs, the public information officer, in coordination with the appropriate park superintendent, may prepare and implement an appropriate public information strategy to inform the public of the park's activities. Special attention should be paid to targeting residents of the surrounding areas.

11.5 District Superintendents

The district superintendents are available to assist with the allocation of personnel from other parks to work on various control efforts in their district.

Appendix I

Specific Control Plan for Exotic Plant Species

Common name:

Scientific name:

Name of State Park:

Date:

Background and Management Information

A. Priority

(Record priority number determined from flow charts in Figures 1a.-1c. Describe what criteria contribute to the priority status for this particular species.)

B. Description

(Briefly describe the habit, life history, native range, and any other pertinent characteristics of the exotic plant species. In most cases, this information can be found in Appendix III where each of the most invasive exotic plant species found in our parks is described.)

C. Current Distribution on the Site

(Describe the current range of the species in the park from baseline monitoring data. Include a range map and information on the density of the population. Also note whether the population is increasing, stable, or decreasing.)

D. Damage and Threats

(Describe how the species degrades a site on the park or could do so if allowed to proliferate.)

E. Goals

(Outline long-term goals for this species. For example, a management goal may be to reduce the numbers of this species so that it no longer threatens populations of a rare species.)

F. Measurable Objectives

(Establish measurable objectives for the control effort. These objectives should include:

- 1. the impact on numbers, density, cover, etc. that you would like to achieve;*
- 2. the size of the area in which you would like to achieve this objective; and*
- 3. the time frame that you would like to achieve this objective.)*

G. Management Options

(Briefly discuss the preferred alternative or alternatives and the conditions under which they may be used. Be sure to include the total anticipated cost of each of these alternatives.)

H. Actions Planned for Treatment and Monitoring

(Briefly describe the locations to be treated, materials and methods to be used, approximate dates and time of year, and an approximate schedule for control and monitoring activities. If several methods are to be tested, outline the design of the planned experiment or demonstration.)

I. Criteria for Success

(Outline the criteria that will be used to evaluate the success or failure of the program. These criteria should be based on the management goals and objectives.)

J. Resource Needs

(Estimate the amount of time for staff and the amount of money that will be required to carry out the planned control, monitoring, and evaluation for this species. Refer to the following worksheet for guidance on estimating resource needs.)

Annual Cost and Labor Worksheet

Common Plant Name:
Year:

Scientific Plant Name:

Date:	Item/Person:	Staff Hrs	Volunteer Hrs	Cost (\$)	Comments:

K. Results of Evaluation

(This section is reserved for when monitoring data on the control effort have been evaluated. Ideally, monitoring data should be taken within the first year after treatment and then each

successive year that the management plan is designed for. These data should then be used to determine whether any sections of the control plan will need to be modified.)

Emergency Information

Include directions and map to nearby hospitals or clinics.

Herbicide Use Protocols Where Herbicide Use is Planned

Note which herbicide(s) will be used and roughly how much will be used. Also outline any state and local requirements for posting of treated areas. Briefly describe how the herbicide(s) will be stored, mixed, and transported. Describe how excess herbicide and any equipment that has become contaminated will be disposed of. Describe emergency first aid procedures and plans for responding to spills or contamination. List the names of herbicide applicators and what protective gear will be available for them.

Herbicide Labels

If herbicide use is planned, attach copies of the herbicide label(s).

Monitoring Data

Photopoint or Photoplot Monitoring Record Form

Park:

Project:

Initial Take Information

Location:

Date:

Retake Frequency:

Describe access, location of permanent point, surrounding area, include sketch map.

Reference Point Descriptions:

Sketch Map below:

Reference Point 1

Description:

Reference Point 2

Description:

Reference Point 3

Description:

Photographic Information:

Photographer:

Camera:

Time:

Lens:

Weather:

Filter:

Film:

ASA:

Notes:

Retake Information

Date:

Camera:

Photographer:

Lens:

Filter:

Film:

ASA:

Appendix II

Example Control Plan for Exotic Plant Species

Common Name: Korean or Sericea Lespedeza Scientific Name: *Lespedeza cuneata*

Name of State Park: Raven Rock State Park

Date: August 20, 1997

Background and Management Information

A. Priority

The priority number for Korean lespedeza as determined from the flow charts in Figures 1a.-1c. is 8. This score indicates that the control of Korean lespedeza is a high priority at Raven Rock State Park. The main criterion contributing to this score is the fact that Korean lespedeza poses an immediate threat to areas that have been planted with long-leaf pines. Although once widespread in eastern North Carolina, long-leaf pine communities are now extremely rare.

At this point, the complete eradication of Korean lespedeza is probably impossible. It can still, however, be controlled and confined to certain areas of the park. Immediate action is necessary to combat Korean lespedeza since this plant is extremely invasive.

B. Description

A native of Japan, Korean lespedeza now occurs from southern New Jersey to central Florida and westward to eastern Texas, Oklahoma, and Kansas. It is also found as far north as the southern half of Illinois, Indiana, and Ohio. A prolific seed producer, this plant can readily colonize early to mid-successional grasslands and open forest communities. In a mixture of grass it usually becomes the dominant species after 3 or 4 years. It has a tendency to form dense stands that prevent or retard the natural invasion of other plants.

C. Current Distribution on the Site

The population of Korean lespedeza is increasing at Raven Rock because this plant is a prolific seed producer as well as the fact that a number of areas in the park are burned in the effort to re-establish long-leaf pine communities. Fire greatly enhances the ability of this species to seed and spread (refer to Figure 1).

D. Damage and Threats

Korean lespedeza is currently hindering the efforts of the park staff to re-establish long-leaf pine communities by shading out the pine seedlings as well as every other species in the herb layer.

E. Goals

The goal for this control effort is to manage Korean lespedeza at suppressed levels such that long-leaf pines and other species associated with this natural community can be re-established. It is also hoped that with the suppression of lespedeza, the natural recruitment of herbaceous species can occur.

F. Measurable Objectives

Approximately 25 acres at Raven Rock State Park need to be managed for the control of Korean lespedeza. The objectives of this control effort are a 95% reduction in cover of Korean lespedeza as well as the prevention of further spreading of this species. Such a significant reduction in cover is necessary to prevent Korean lespedeza from regaining a strong foothold in successive years. This objective will take approximately five years to achieve.

G. Management Options

An effective way to control Korean lespedeza is to mow it during the growing season and then spray it with Roundup. The park staff at Raven Rock would prefer to purchase a skid sprayer to treat the lespedeza with herbicide instead of hiring a tractor operator with a boom sprayer. In this way, the spray radius can be controlled more effectively in areas that are already planted with long-leaf pine seedlings. Although the less expensive alternative is to hire an herbicide applicator, this alternative is only viable in areas where long-leaf pines have not been planted. Because of this limitation, only the cost to treat the areas with a skid sprayer is calculated. Refer to Section J where resource needs are calculated.

H. Actions Planned for Treatment and Monitoring

Given limited staff time, it is impossible to mow and treat the entire 25 acres of Korean lespedeza with Roundup in one year. Realistically, approximately 5 acres can be mowed and treated with herbicide each year. This treatment should ideally occur in the early summer when the plants are still actively growing. After an area has been treated with herbicide, it will be monitored annually. Areas that are not being treated with herbicide in a particular year will be mowed in August while the Korean lespedeza is flowering but before it has set seed to prevent further spread of the plant. After the entire 25 acres has been initially treated with Roundup, spot treatments of Roundup will be required in successive years. At that point, monitoring for the entire area will be done annually.

I. Criteria for Success

The success of this program will be based on reducing the cover of Korean lespedeza by 95% of pretreatment levels and preventing the spread of this plant to new locations.

J. Resource Needs

Annual Cost and Labor Worksheet

Year: 1998

Date:	Item/Person:	Staff Hrs	Volunteer Hrs	Cost (\$)	Comments:
June	skid sprayer			1,000	
	mower operator	4		40	\$10/hour
	gas for mower			11.5	\$1.15/gallon
	herbicide applicator	40		400	\$10/hour
	Roundup			280	\$56/gallon
August	mower operator	16		160	\$10/hour
	gas for mower			46	\$1.15/gallon
total cost				1,937.50	

The total estimated cost for the first year of this control program is \$1,937.50. This cost includes the initial one time price for a skid sprayer of \$1,000 plus \$937.50 for mowing and herbicide application. This estimate assumes that it takes approximately 4 hours to mow 5 acres and that it takes approximately 8 hours to apply herbicide onto 1 acre. Note that in the first year 5 acres are mowed and sprayed with herbicide in the early summer when the Korean lespedeza is actively growing. The rest of the twenty acres will be mowed in August while the Korean lespedeza is flowering but before it sets seed. The annual cost for the successive 4 years of intensive treatment should remain at approximately \$937.50 given that the area to be mowed will decrease but that spot treatments of herbicide will be necessary in areas that have previously been treated. The costs for annual monitoring given that photographic monitoring is employed are negligible.

K. Results of Evaluation

(This section is reserved for when monitoring data on the control effort have been evaluated. Ideally, monitoring data should be taken within the first year after treatment and then each successive year that the management plan is designed for. These data should then be used to determine whether any sections of the control plan will need to be modified.)

Emergency Information

The closest hospital to Raven Rock State Park is Central Carolina Hospital in Sanford. From the park take 421 North. In Sanford, 421 will turn into Horner Boulevard. Take a left at the light at Field's Drive and the hospital will be on the right (refer to Figure 2).

Herbicide Use Protocols Where Herbicide Use is Planned

Roundup (glyphosate) will be used for this control effort at a rate of 1 gallon (concentrated) per acre. There are no requirements for posting areas that have been treated with glyphosate.

The herbicide will be stored in a cool, dry area of the maintenance building. If mixing is necessary, this activity will also be done at the maintenance building. The herbicide will be transported to the field site in watertight containers placed in the back of a pickup truck.

Excess herbicide will be applied to target weeds in the park. Application equipment and empty herbicide containers will be triple rinsed with 10% of the container volume for each rinse. This wastewater will also be applied to target weeds. Empty containers will be punctured and disposed of in the garbage.

On-site first aid kits should always contain at least two gallons of potable water, eyewash bottles with buffered isotonic eyewash, soap, and paper towels. In addition, a shovel, plastic garbage bags, and soil absorbant (eg. cat litter) should be taken to the field site in case of a spill.

Applicators at Raven Rock State Park may include: Paul Hart, David Brown, Jonathan Griffith, and Wayne Rouse. For mixing and applying herbicides, applicators must at a minimum wear rubber boots, a long sleeved shirt and long pants, rubber gloves (not fleeced lined), and safety goggles. This apparel should be washed in soap and water after use. Applicators should always wash their hands and any other areas that were exposed to the herbicide as soon as possible. It is also recommended that applicators shower and change clothing as soon as possible.

Herbicide Label

ROUNDUP

DIRECTIONS FOR USE

It is a violation to use this product in a manner inconsistent with its labeling.

READ ENTIRE LABEL. USE STRICTLY IN ACCORDANCE WITH LABEL PRECAUTIONARY STATEMENTS AND DIRECTIONS.

WHEN TO USE: Use anytime weeds and grasses are actively growing. Treated weeds usually show initial symptoms within hours and complete kill in 1 to 2 weeks. Larger more established weeds may take up to 4 weeks for a complete kill. Roundup works best in warm sunny weather with daytime temperature above 60°F. Reapply if it rains within 6 hours after application. If hard-to-control weeds are not killed within 4 weeks, reapply.

HOW TO USE: To treat individual weeds adjust the nozzle to a coarse spray. Spray when air is calm. Position sprayer tip approximately 1 to 2 feet from weeds and apply until completely covered. **IMPORTANT: Roundup is an all-purpose weed and grass killer which will kill**

almost all plants contacted. If necessary, use cardboard or plastic to shield desirable plants. If plants are accidentally sprayed, rinse off immediately with water. Do **NOT** use for spot weed control in lawns since Roundup kills all green plants, including lawn grass. Sprayed areas can be replanted with ornamentals or flowers the day after treatment.

STORAGE: Store this product in its original container, in a secure area. Protect container from freezing. **DISPOSAL:** To dispose of partially used or empty container, securely wrap it in several layers of newspaper and discard in trash. In case of SPILL or LEAK, soak up with paper towels and discard in trash. Do not reuse empty container except for refill in accordance with refill instructions.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS & DOMESTIC ANIMALS

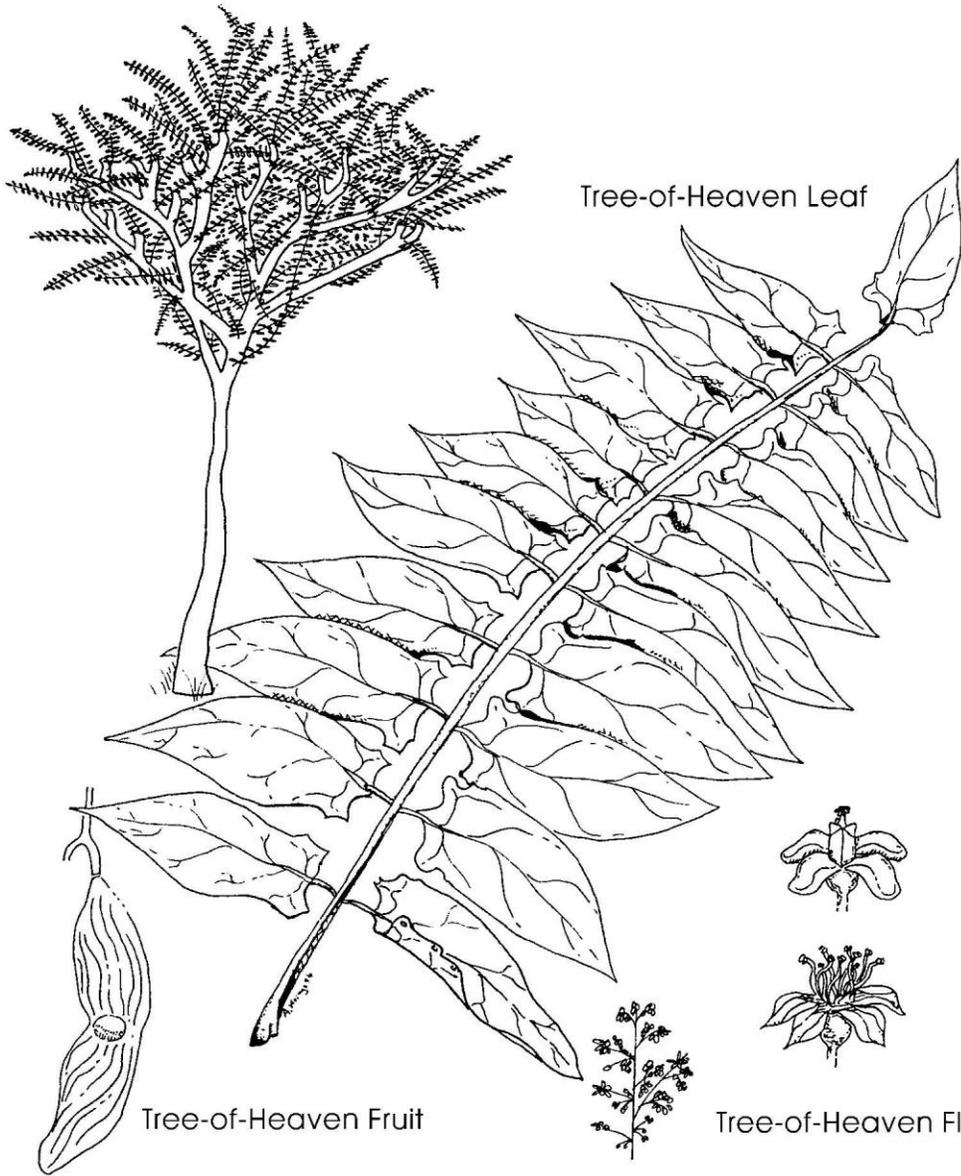
CAUTION: Causes eye irritation. Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling. People and pets may re-enter treated areas after spray has dried.

FIRST AID: If in Eyes: Flush eyes with plenty of water. Call a physician if irritation persists. In case of emergency involving this product, call 1-800-454-2333. **ENVIRONMENTAL**

HAZARDS: Do not apply directly to water. Do not contaminate water when disposing of equipment washwaters. **NOTICE:** Buyer assumes all responsibility for safety and use not in accordance with directions.

Monitoring Data

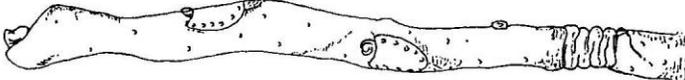
To be completed after the first year of the control plan.



Tree-of-Heaven Leaf

Tree-of-Heaven Fruit

Tree-of-Heaven Flower



Appendix III

Invasive Exotic Plant Species in North Carolina's State Parks

Tree-of-Heaven (*Ailanthus altissima*)

Description

Tree-of-heaven is a small to medium sized tree with smooth, gray bark that can achieve a maximum height of up to 100 feet. Leaves are alternate along the stem and are compound, composed of 11-40 leaflets oppositely arranged along the leaf stem with a terminal leaflet. Each leaflet is two to five inches long, lance-shaped, with a pointed tip and blunt base. Most leaflets have one to three coarse teeth near their base. When crushed, the leaves produce a distinctive, offensive odor that has been described as “the smell of burnt peanut butter.”

The tree flowers in July and August, with flowers occurring in panicles (much-branched flower cluster) at the ends of the branches. Each greenish-yellow flower has five sepals and petals. Seeds are encased in a papery sheath called a samara. The samaras are slightly twisted or curled and can be carried by the wind great distances from the parent plant.

Habitat

Tree-of-heaven readily establishes on disturbed sites such as vacant lots of the inner city, railroad embankments, highway medians, fence rows, and roadsides. In naturally forested areas, disturbance created by severe storms or insect infestations can open the way for the invasion of tree-of-heaven.

Distribution

Tree-of-heaven is native to a region extending from China south to Australia. It was imported to the United States in 1784 by a Philadelphia gardener. In the west, it was brought over by Chinese immigrants who use it for medicinal purposes.

Threats

Tree-of-heaven is an aggressive competitor that propagates by both seeds and underground runners. Once established, it can grow several feet every year. One tree can produce up to 350,000 seeds per year. Seedlings establish a taproot three months from germination allowing this plant to outcompete most native plants for sunlight and space. Furthermore, tree-of-heaven also produces a toxin in its bark and leaves that can accumulate in the soil and inhibit the growth of other plants.

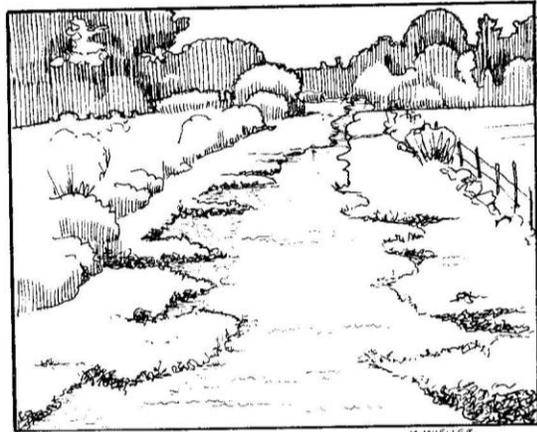
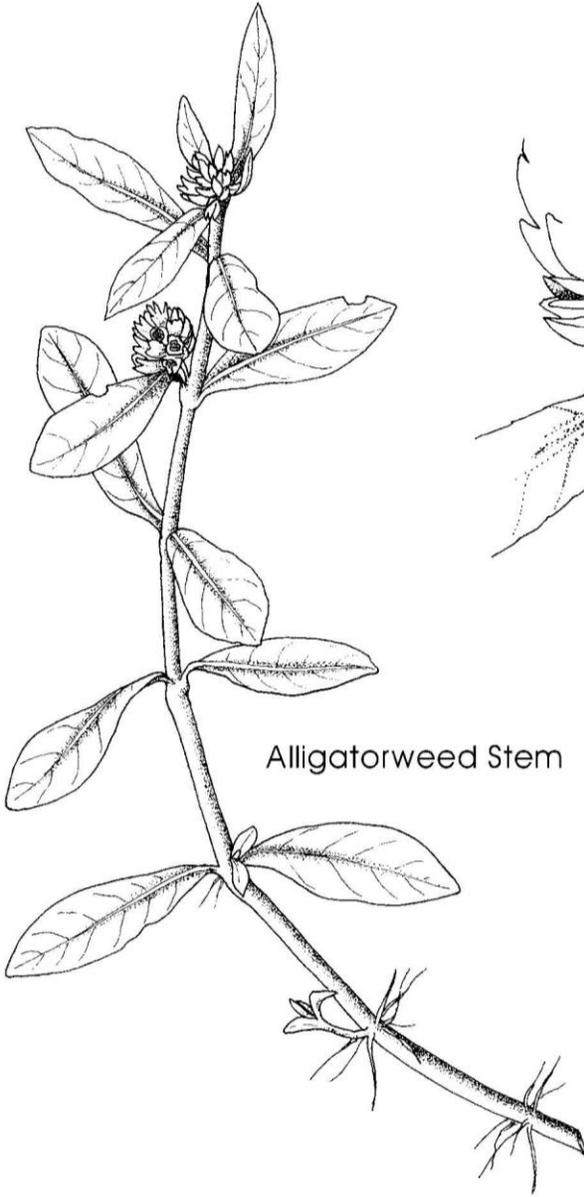
Control

This tree is best eliminated while still small since it is very difficult to remove once it has established a tap root. At first, the root system is shallow so that seedlings can simply be pulled out, roots and all, when the soil is moist and loose. When the tree becomes too large for mechanical removal, another option is to cut the tree down near to the ground and either paint or spray the freshly cut stumps with a 50% solution of glyphosate or triclopyr. Late spring to early fall is the best time to apply this herbicide since in the spring sap may flow to the surface of the cut and rinse the chemical off. Late fall to early spring, translocation is too poor to adequately distribute the chemical through the plant. In addition, the basal section of the tree (ground to 12 inches) can be treated with a solution of 25% triclopyr and 75% horticultural oil. After treatment, wet the area thoroughly.

Alligatorweed Flower



Alligatorweed Stem



Appendix III (continued)

Alligatorweed (*Alternanthera philoxeroides*)

Description

Alligatorweed is an aquatic and sometimes terrestrial plant that is characterized by opposite, non-succulent leaves and small white flowers that grow on a terminal spike. In its aquatic stage, the stems of this plant are hollow providing great buoyancy and enabling the plant to achieve lengths of up to 45 feet. The stems can also root at the closely spaced nodes giving the plant the ability to begin a new mat elsewhere. In the terrestrial stage, the stems of alligatorweed are usually not hollow and the leaves tend to be smaller.

Habitat

Alligatorweed roots in soil along the shore or in shallow water and then grows across the surface forming a dense interwoven floating mat. This plant grows primarily as an emersed aquatic plant but can also thrive in wet or dry soils.

Distribution

Alligatorweed, a South American immigrant, was first authentically recorded in 1897 near Mobile, Alabama, although it might have been found in Florida as early as 1894. It was present near New Orleans in 1898 and was recognized as a threat to waterways as early as 1901. Populations of alligatorweed, however, were mostly held in check by the more aggressive waterhyacinth, *Eichhornia crassipes*, until modern herbicides arrived in the late 1940's. Alligatorweed, which was more resistant than waterhyacinth to 2,4-D and other herbicides, often replaced waterhyacinth after both were sprayed. By 1963, an estimated 162,000 acres of water from North Carolina south to Florida and west to Mississippi were infested.

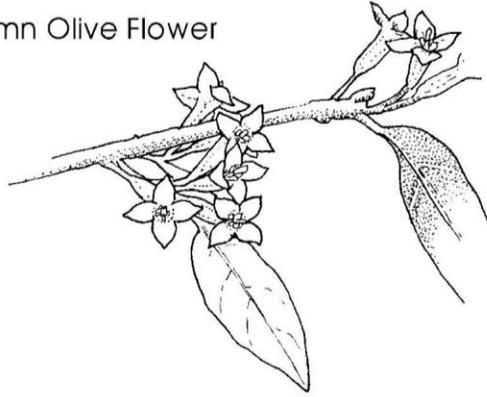
Threats

The hollow stems of this plant can grow to great lengths and allow plants to form dense floating mats that extend far into bodies of water. These mats reduce or eliminate native plants, are impenetrable to motor boats, and restrict water movement. Of particular concern is the ability of this plant to root at the stem nodes allowing alligatorweed to spread very rapidly as pieces of stem break and float away.

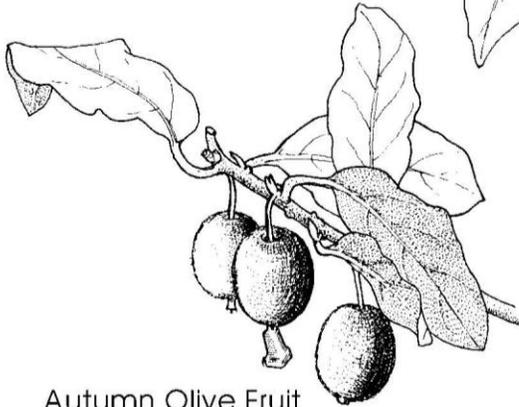
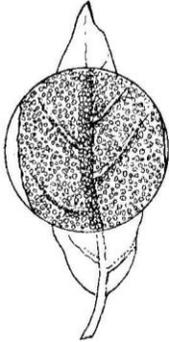
Control

At present, chemical control is the only viable means for alligatorweed control. Two herbicide treatments of Rodeo (a formulation of glyphosate that has been approved for use over water), one early in the growing season and one in late-summer or early fall, are most effective for the initial treatment of alligatorweed. After three or four years when the infestation of this weed is reduced to a maintenance level, only minor annual treatments should be required. The terrestrial stage of alligatorweed is more difficult to manage because of the formation of a large tap root. As with the aquatic stage, two herbicide treatments of glyphosate are needed each year during the growing season until the weed is reduced to a maintenance level where only one annual treatment is required. It may take at least four or five years, however, to reduce the terrestrial stage of alligatorweed to a maintenance level.

Autumn Olive Flower



Autumn Olive Stem



Autumn Olive Fruit



Appendix III (continued)

Autumn Olive (*Elaeagnus umbellata*)

Description

Autumn olive is a deciduous shrub or small tree with alternate, oval, untoothed leaves. The underside of the dark green leaf is characteristically covered with silver-white scales. After the leaves have appeared early in the growing season, small, light yellow, fragrant flowers are borne along the twigs. The small round fruits are reddish to pink, dotted with scales, and produced in great quantity.

Habitat

Typical habitats of autumn olive are disturbed areas, roadsides, pastures, and fields in a wide range of soil types. This plant has nitrogen-fixing root nodules that allow it to thrive in poor soils. It does not do well in wet or densely forested areas but has considerable tolerance to drought.

Distribution

A native to China, Korea, and Japan, autumn olive was introduced to the United States for cultivation in 1830. It has been planted in the eastern and central United States for revegetation of strip mines and other disturbed areas, as an ornamental shrub, and as wildlife cover.

Threats

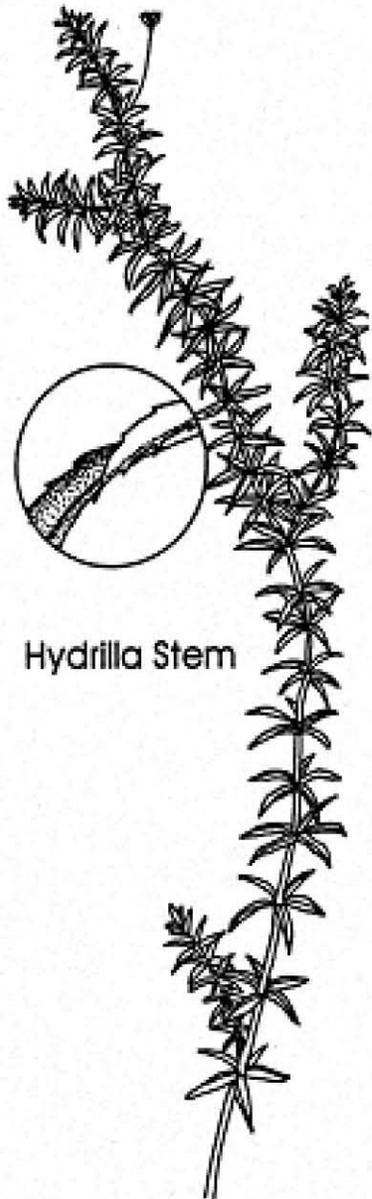
Autumn olive has the potential of becoming one of the most troublesome invasive shrubs in the central and eastern United States. It exhibits prolific fruiting, rapid growth, wide dispersal by birds, and the ability to adapt to many sites. It also resprouts vigorously after cutting or burning. Populations of this shrub should be closely monitored and infestations eliminated while they are still small.

Control

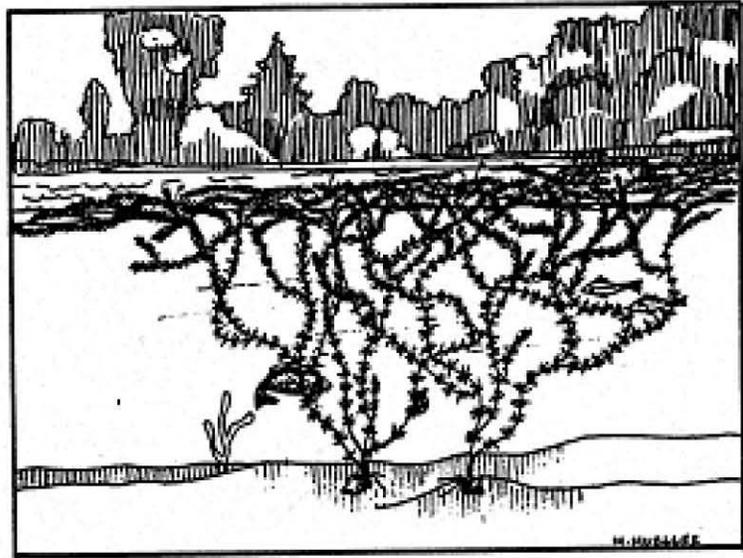
Seedlings and sprouts can be grubbed by hand when the soil is moist to insure removal of the root system. With larger plants, cutting alone results in thicker, more vigorous growth. Burning also results in vigorous resprouting.

Foliar application of a solution of 1 to 2% glyphosate or triclopyr with a 0.5% nonionic surfactant may be adequate for small patches of autumn olive. Application of herbicide should be done in late August or September when the plant is actively translocating materials to the

roots. The plant can also be cut off at the main stem and immediately painted with a 50% solution of glyphosate or triclopyr. Be sure to cover the outer 20% of all cut stumps. In addition, the basal section of the plant (ground to 12 inches) can be treated with a solution of 25% triclopyr and 75% horticultural oil. After treatment, wet the area thoroughly.



Hydrilla Stem



Hydrilla Leaves

Appendix III (continued)

Hydrilla (*Hydrilla verticillata*)

Description

Hydrilla grows submersed in water and is generally rooted to the bottom, although in some cases fragments will break loose and survive in a free-floating state. The coarsely serrated leaves of this plant occur in whorls of three to eight and have characteristic spines on the underside of the midrib. It closely resembles *Elodea canadensis* and *Egeria densa*, except that these two species do not have spines.

Hydrilla produces reproductive propagules called turions and tubers. Turions are compact dormant buds that are produced in leaf axils and fall from the plant when they are mature. Tubers are formed terminally on rhizomes and can be found up to a foot deep in the sediment.

Habitat

Hydrilla occurs primarily in lakes and ponds of tropical and temperate climates.

Distribution

Hydrilla is probably native to the warmer regions of Asia. It is a cosmopolitan species that occurs in Europe, Asia, Australia, New Zealand, the Pacific Islands, Africa, Europe, South America, and North America. Hydrilla was first discovered in the United States in 1960 and is now found in all Gulf Coast states, Atlantic Coast states as far north as Maryland and Delaware, and in the western states of California, Washington, and Arizona.

Threats

Hydrilla has many characteristics that enable it to compete so effectively and displace native aquatic vegetation. First, the growth habit of hydrilla enables it to compete effectively for sunlight. This plant can grow very rapidly, up to one inch per day, until it nears the water surface. Near the water surface it branches profusely and forms a thick mat, enabling this plant to intercept sunlight to the exclusion of other submersed plants.

Second, hydrilla is able to grow under a wide range of water chemistry conditions. It is commonly found in a range of lakes from oligotrophic to eutrophic. It can also grow in water up to nine to ten parts per thousand salinity (brackish) while also tolerating a wide range of pH.

Third, this plant is adapted to use low light levels for photosynthesis. Hydrilla can, therefore, begin to photosynthesize earlier in the morning allowing it to successfully compete with other aquatic plants for a limited amount of dissolved carbon. This requirement for low light also allows hydrilla to colonize in deeper water than other aquatic plants.

Fourth, although capable of reproducing by seed, hydrilla is particularly successful because of its varied modes of vegetative reproduction. Hydrilla can sprout new plants from stem fragments containing as few as two whorls of leaves. Fragments from rhizomes can also form new plants. This characteristic means that small amounts of hydrilla on boat trailers, bait buckets, etc. can spread the plant from place to place. The most troubling reproductive trait of hydrilla for aquatic plant managers is the production of tubers and turions. These propagules can withstand ice cover, prolonged drying, ingestion and regurgitation by waterfowl, and herbicides.

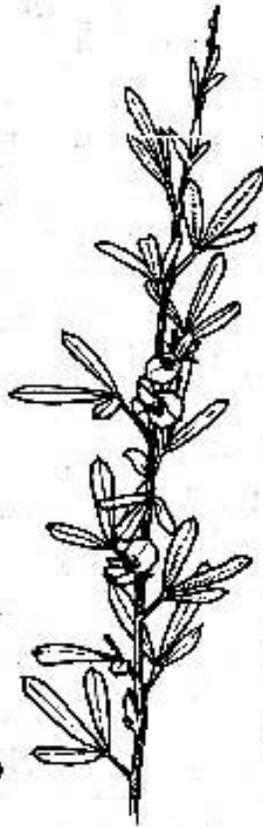
Control

A variety of control methods have been used on hydrilla including mechanical removal, dessication through lake drawdown, and herbicide application. In North Carolina, the least expensive and most effective method of control has been the use of sterile, triploid grass carp. The stocking and monitoring of grass carp in infested lakes can be coordinated through the Department of Environment and Natural Resources, Division of Water Resources, Aquatic Weed Control Program, P.O. Box 27687, Raleigh, NC 27611, (919)-733-4064. Keep in mind that grass carp are non-specific herbivores and will, therefore, consume desirable native species of aquatic plants in conjunction with hydrilla.

Please note that hydrilla is listed as a state noxious weed. All suspect infestations of hydrilla should be reported immediately to the North Carolina Department of Agriculture, Plant Industry, Plant Protection Section, P.O. Box 27647, Raleigh, NC 27611, (919) 733-6932, or toll free - 1-800-206-WEED (9333).



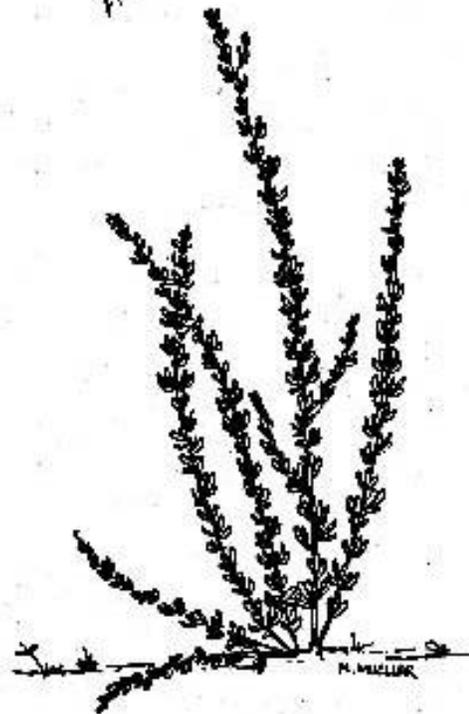
Lespedeza Stem



Lespedeza Flower



Lespedeza Leaf



Appendix III (continued)

Korean or Sericea Lespedeza (*Lespedeza cuneata*)

Description

Korean lespedeza is a perennial legume ranging in height from 1.5 to 5 feet. The blunt-tipped leaves of this plant are arranged alternately in groups of three along the entire length of the stem. The stems are herbaceous to somewhat woody with numerous straight branches.

The inconspicuous flowers of lespedeza are creamy-white with purple markings and grow in the axils of the leaves from the middle to the upper portions of the plant. They bloom in late summer or early fall.

Habitat

Korean lespedeza is found in open woodlands, clearings, borders, old fields, roadsides, and urban waste areas.

Distribution

Korean lespedeza is native to Japan and now occurs from southern New Jersey to central Florida and westward to eastern Texas, Oklahoma, and Kansas. It occurs as far north as the southern half of Illinois, Indiana, and Ohio.

Threats

A prolific seed producer, this plant can readily colonize early to mid-successional grasslands and open forest communities. In a mixture of grass it usually becomes the dominant species after 3 to 4 years. It has a tendency to form dense stands that prevent or retard the natural invasion of other plants.

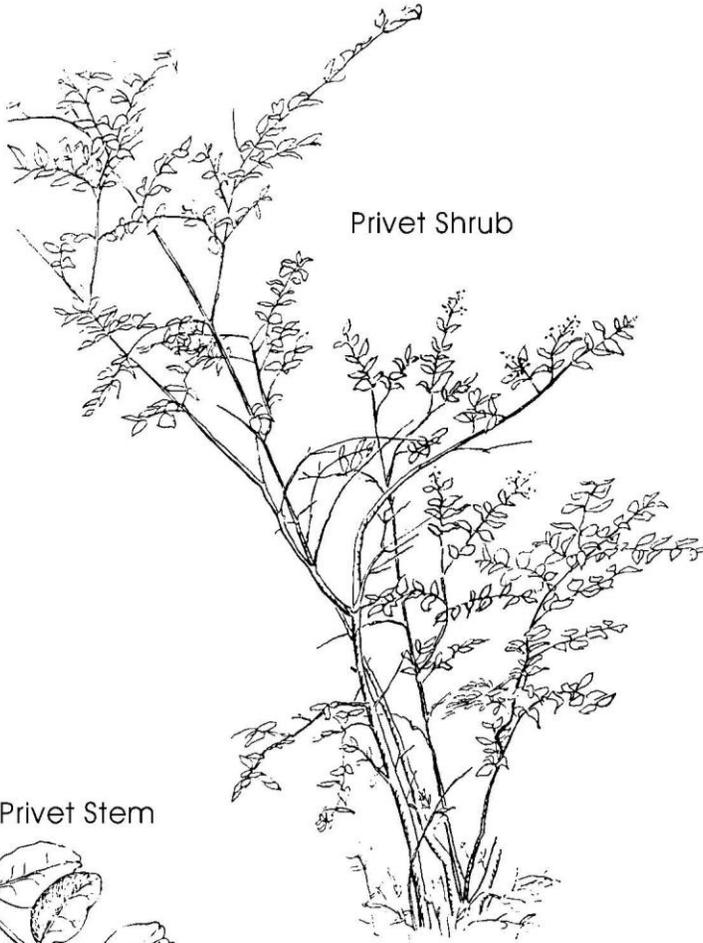
Control

At present, little is known about the control of this plant. Spraying the foliage of lespedeza with a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant has some promise for control. The North Carolina Department of Transportation has found that the herbicide Transline is very effective for controlling lespedeza and should be applied in a 0.5% solution with 0.5% nonionic surfactant. This herbicide should not be used near water because of its toxicity to fish and insects. Either herbicide should be applied during the active growing season before the plant has had a chance to set seed. Mowing lespedeza in the flower bud stage for 2 to 3 consecutive years will also help to curtail the spread of this plant.

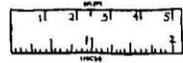
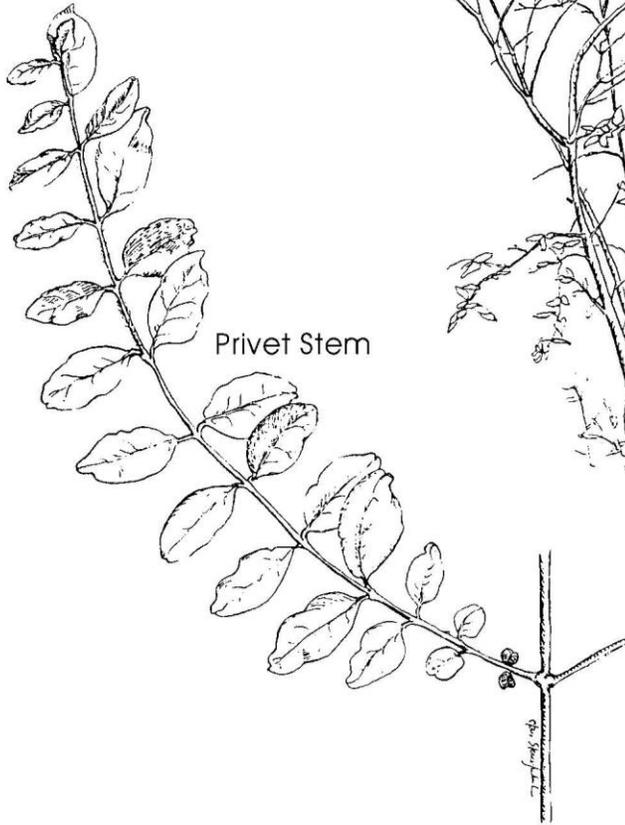
Privet Fruit



Privet Shrub



Privet Stem



Appendix III (continued)

Chinese Privet (*Ligustrum sinense*)

Description

Chinese privet is a multi-branched shrub that can grow up to 12 feet high. In North Carolina, it is evergreen in most of the state but may be semi-evergreen at higher elevations. The elliptical-shaped leaves are small (usually only one to one and a half inches long), smooth-edged, and oppositely arranged along the branches. The upper surface of each leaf is dark green, shiny, and leathery and the lower surface is pale green. A distinguishing feature of this plant is that the midrib of each leaf is hairy on the underside.

The flowers are tiny and white and grow in branching clusters at the ends of the twigs. The flowers are also quite fragrant with a smell that has been likened to cheap perfume. The black, pea-sized berries are a favorite food for a variety of birds.

Habitat

Chinese privet is usually found in lowlands and waste places often under a shady canopy. It frequently forms dense thickets.

Distribution

Chinese privet is a native of China and has been cultivated extensively in the southern United States.

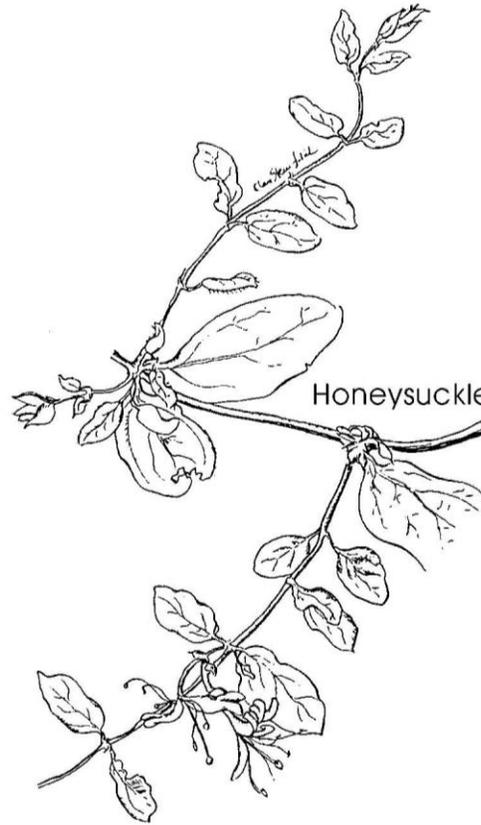
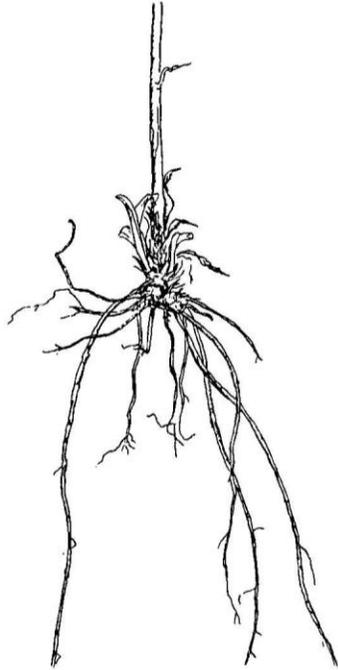
Threats

Propagated by seeds that are readily carried and spread by birds, this shrub has become an intrusive pest in natural areas, particularly in wooded floodplains.

Control

Chinese privet bushes with stems one inch or smaller can be removed by hand pulling. Since the root system of these plants is extensive, pulling larger plants is seldom possible. Larger plants can be killed by spraying the foliage with a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant. The leaves of the privet should be completely wetted, one bush at a time. Treatment is most effective on fully developed foliage, especially late in the summer. Another option is to cut the shrub down near to the ground and either paint or spray the freshly cut stumps with a 25% solution of glyphosate or triclopyr.

Honeysuckle Roots



Honeysuckle Stem



Honeysuckle Flower



Honeysuckle Fruit

Appendix III (continued)

Japanese Honeysuckle (*Lonicera japonica*)

Description

Japanese honeysuckle is a trailing or twining woody vine that can grow to more than 30 feet in length. Young stems are often hairy, while older stems are hollow with a reddish brown bark. The oblong to oval shaped leaves are one to two and a half inches long and grow along the stem in opposite pairs. In most of North Carolina, the leaves of Japanese honeysuckle are semi-evergreen and may persist on the vines year-round. The whitish, trumpet-shaped flowers occur in pairs from between leaves and bloom from late April into August. The fruit is a black, pulpy berry that matures in early autumn.

Japanese honeysuckle is distinguished from North Carolina's three native species by the leaves near the tips of the vines. These leaves are separate and not united. In our native species, these leaves are united at the base, forming a single leaf surrounding the stem.

Habitat

Japanese honeysuckle occurs primarily in disturbed habitats such as roadsides, trails, fence rows, abandoned fields, forest edges, and in many types of forests. It often invades native plant communities after natural or human induced disturbances such as logging, road building, floods, windstorms, or pest and disease outbreaks. It is especially prevalent and invasive in disturbed bottomlands.

Distribution

Imported to the United States in the 1800's as horticultural groundcover, Japanese honeysuckle is native to eastern Asia. In North Carolina, Japanese honeysuckle is naturalized statewide and is one of the most abundant plants in the state.

Threats

Since it propagates by both seeds that birds disseminate or by shallow, underground runners that can extend as much as 45 feet, this plant is very successful. In forests, Japanese honeysuckle vines spread both vertically and horizontally by climbing up tree trunks and/or by trailing over the forest floor.

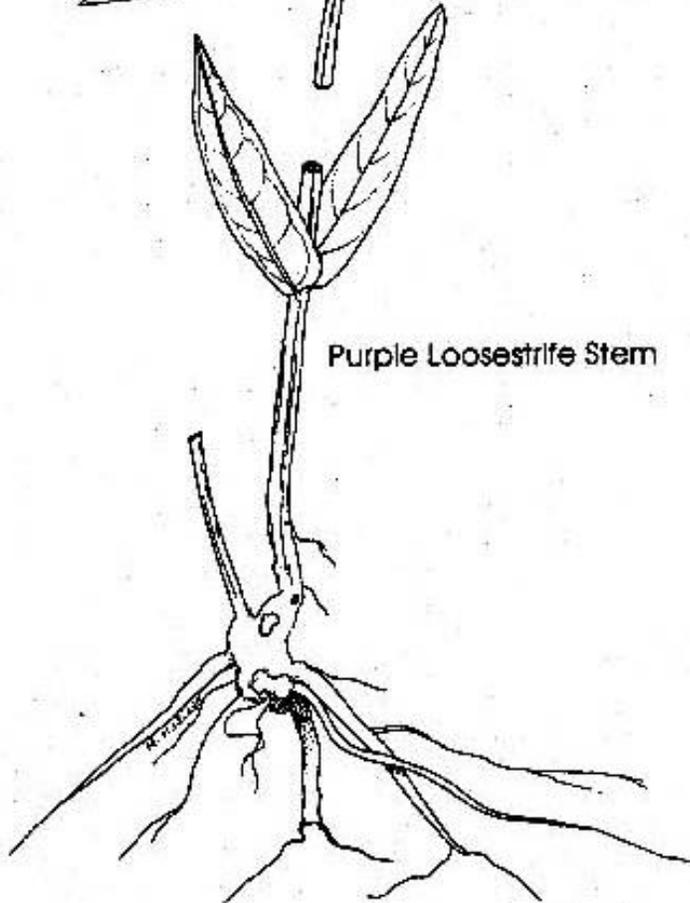
Dense, strangling growths of Japanese honeysuckle can impact natural vegetation by decreasing light availability, depleting soil moisture and nutrients, or by toppling upright stems by the sheer weight of accumulated vines. It is seen by many managers of preserves as the state's most formidable species of exotic plant.

Control

Small populations of Japanese honeysuckle can be controlled by careful hand-pulling, grubbing with a hoe or a shovel, and removal of trailing vines. In fire-dependent natural communities, Japanese honeysuckle can be controlled by prescribed burning. Burning can reduce the abundance of Japanese honeysuckle by up to 50%, but the area must be successively burned every year or every other year. The use of glyphosate or triclopyr is also an effective treatment either by itself or after a prescribed fire. The fact that the leaves of Japanese honeysuckle are evergreen in many parts of North Carolina provides an opportunity to treat this plant in the fall (October-November) after surrounding vegetation has become dormant. Apply a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant to thoroughly wet all foliage. For vines climbing into surrounding trees use a 25% solution of glyphosate or triclopyr on cut vine surfaces. Ambient air temperature should be above 65°F.



Purple Loosestrife Flower



Purple Loosestrife Stem



Appendix III (continued)

Purple Loosestrife (*Lythrum salicaria*)

Description

Characterized by long showy spikes of magenta flowers, purple loosestrife is an herbaceous, perennial, wetland plant. The plant ranges in height from two to six feet but may reach up to 10 feet in height in nutrient-rich habitats. The leaves are opposite or in whorls of three, lance-shaped, and without teeth. Purple loosestrife has flowers with five to seven petals occurring in dense clusters on terminal spikes. These flowers begin blooming in June and continue until September.

Habitat

Purple loosestrife is found in a variety of sunny wetland habitats including marshes, river banks, the edges of ponds and reservoirs, as well as ditches and other disturbed wetland areas. It grows best in high organic soils but tolerates a wide range of soil textures including clay, sand, and silt.

Distribution

A native of Eurasia, purple loosestrife was introduced into the northeastern United States and Canada in the early 1800's. Although this plant has subsequently spread through most of temperate North America, the heaviest concentrations are in the glaciated wetlands of the northeast. It is present but has not yet become a dominant invasive plant in North Carolina. **Please note that purple loosestrife and all other non-native Lythrum species are listed as state noxious weeds. All suspect infestations of purple loosestrife should be reported immediately to the North Carolina Department of Agriculture, Plant Industry, Plant Protection Section, P.O. Box 27647, Raleigh, NC 27611, (919) 733-6932, or toll free - 1-800-206-WEED (9333).**

Threats

Purple loosestrife thrives in disturbed wetlands but also invades natural wetlands, crowding out native wetland vegetation and forming extensive monospecific stands. As a result, the wildlife value of wetland habitats is greatly diminished.

A single stalk of purple loosestrife may produce as many as 300,000 seeds and densities of up to 80,000 stalks per acre. The species also readily reproduces from stem or root segments. Although not yet a significant invasive problem in North Carolina, wetland communities should

be closely monitored for the presence of purple loosestrife because of its potential devastating effects. It has dominated marshes and bogs in a number of states in the Northeast.

Control

Since small infestations of purple loosestrife can be removed by hand pulling, the early detection of this plant is critical to its control. Hand removal should always be done before the plants flower to prevent the scattering of seeds. The entire rootstock must be pulled out since the plant can rejuvenate from root fragments. In addition, plants that are pulled should be bagged on site to prevent dispersing the stem and root segments.

Where mechanical removal is not feasible, purple loosestrife may be removed by spot application of Rodeo (a formulation of glyphosate that has been approved for use over water) before or during the period of peak bloom, usually late August. The best way to apply this herbicide is to cut off all stems at about six inches (be sure to bag this refuse) and then paint or drip a 20-30% solution of Rodeo onto the cut surface. As with mechanical control methods, follow-up treatments may be needed in subsequent years to remove new plants that have sprouted from the seed bank.

For large areas a foliar spray may be necessary. Apply a solution of 2% Rodeo and 0.5% nonionic surfactant before flower head formation. If possible, cut the flower heads (bag these heads) before applying herbicide to ensure the prevention of seed production.

The most effective herbicide for controlling purple loosestrife is Garlon 3A. Since this product is still under experimental use for aquatic plants, it would have to be applied experimentally under supervision of the manufacturer, Dow Elanco.

Appendix III (continued)

Japanese Grass (*Microstegium vimineum*)

Description

This annual grass grows to be up to two to three feet by late summer. It has long, thin, alternate, lance-shaped leaves along a branched stalk. In spring and early summer the grass is shorter and more tender in appearance. The stalk of this grass is distinctly divided by nodes with flattened segments between the nodes that get wider toward the upper end.

Habitat

Japanese grass is often found in bright green patches along the margins of roads or paths and less frequently on forest floors. Preferring shaded or partially sunny areas, it tends to get a stronghold in moist areas which can be particularly troublesome when close to water courses since water aids in the dispersal of seeds. A number of bottomlands in the parks system have been heavily impacted by this weed.

Distribution

This grass was imported as an ornamental from Asia. It was not common as late as 1970 but has exploded in the past two decades and is now common throughout North Carolina.

Threats

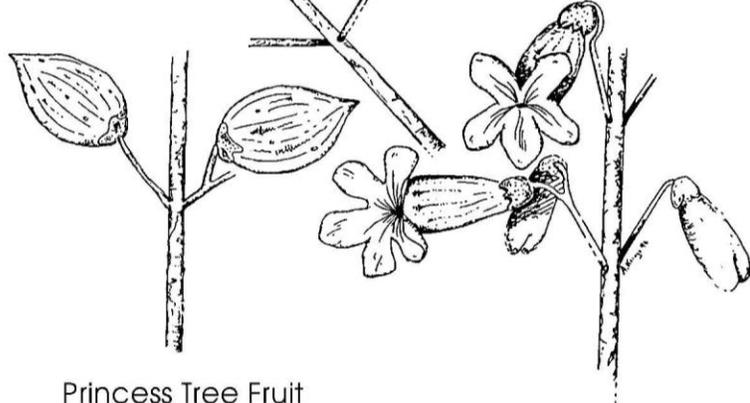
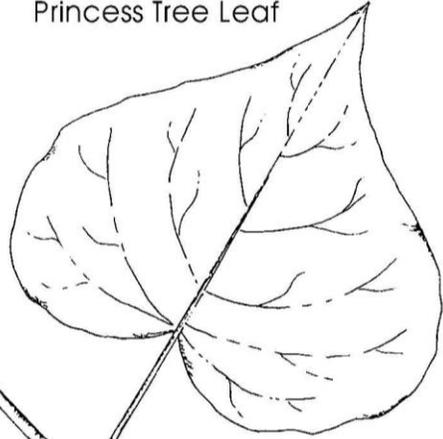
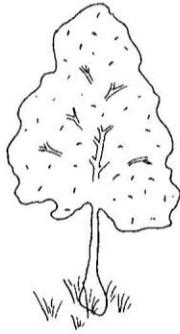
Japanese grass is a quickly spreading annual plant that produces seeds for the following year and then dies in the fall. It propagates both by shallow runners and seed and spreads in dense patches that eventually exclude most other plants. The plant spreads primarily in the spring and summer before flowering and the production of seed in late summer and early fall.

Control

The best time for removing Japanese grass is early in the growing season when it is small and before seed production. While young, the grass is shallow-rooted and easy to grub out by hand. Mowing while in flower and before seed production has also been effective in controlling the spread of this grass. Extensive areas of Japanese grass may be controlled by the herbicide Vantage (sethoxydim). This herbicide is particularly attractive because the active ingredient rapidly decomposes in soil and it acts mainly on grasses leaving most broad-leaved plants unaffected. This herbicide kills both perennial and annual grasses within about 14 days by

interfering with an enzyme involved in lipid synthesis. Herbicide treatments should be made late in the growing season but before the plants set seed. Apply a 1.5% solution of sethoxydium and 1% horticultural oil when the air temperature is above 65°F and rain is not expected within one hour following application. A solution of 2% glyphosate and 0.5% nonionic surfactant may also be used.

Princess Tree Leaf



Princess Tree Fruit

Princess Tree Flower

Appendix III (continued)

Princess Tree (*Paulownia tomentosa*)

Description

Princess tree may reach a height of up to 50 feet. The bark of this tree is characteristically gray with shallow, shiny ribs. The leaves are large (5-10 inches long on mature trees), heart-shaped, and oppositely arranged along the branches. The edges of the leaves often have blunt “horns” on each side. Stump sprouts and young plants have extremely large leaves that can be up to 32 inches long.

This tree flowers in April and May, usually before its leaves have fully emerged. The very, large, light purple flowers are distinctively sticky and hairy on the outside. These flowers are arranged in pyramidal clusters that are about 10 to 15 inches long. The fruits of this tree persist in large brown clusters through the winter and into early spring. The seeds from these fruits are small and winged and disperse easily.

Habitat

Princess tree favors sunny locations along roadsides, clearings, and borders of forests.

Distribution

The princess tree was imported from East Asia for horticultural purposes. It has since escaped cultivation and is scattered in a number of locations throughout the state, particularly in the mountains and foothills of western North Carolina.

Threats

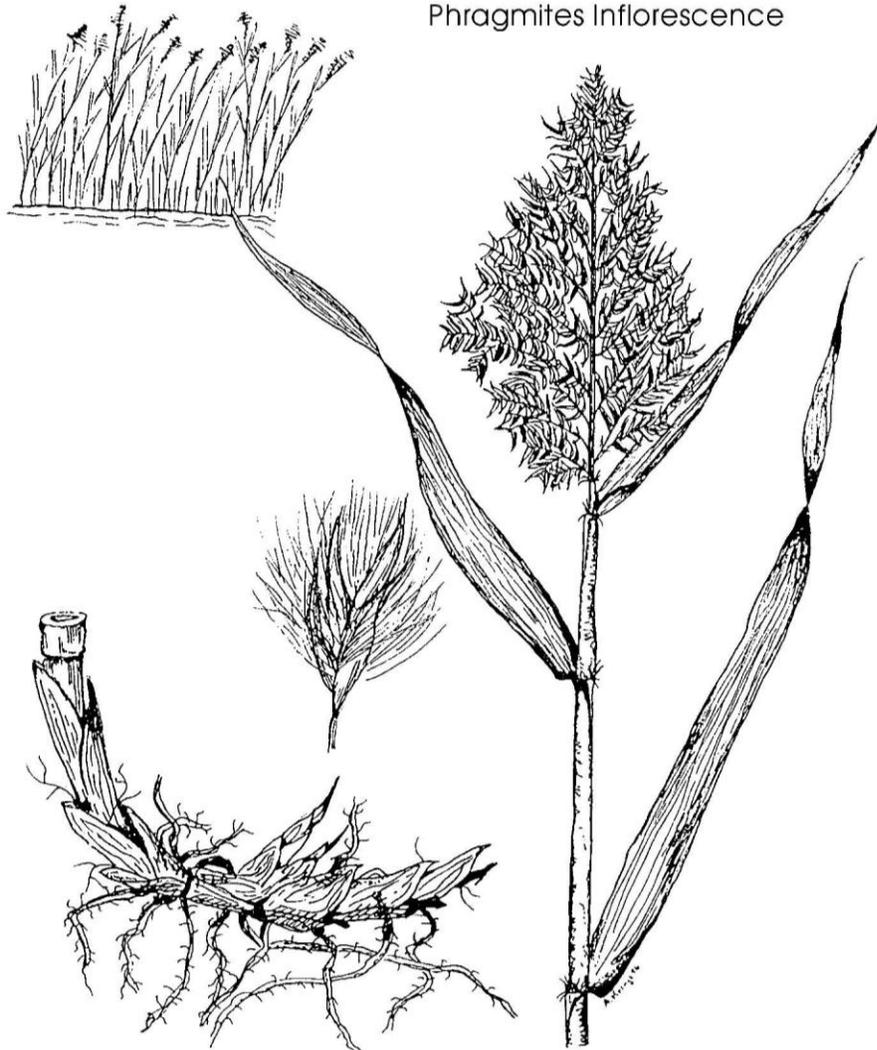
Once princess tree escapes into the wild, it is an extremely fast-growing competitor with native species. Propagating from seeds, this tree may be six to eight feet in its second year of growth.

Control

It is best to eliminate princess tree by hand when it is still a small sapling without a well-developed taproot. Of course this stage is short-lived since the tree is usually too big to manually remove by its second year.

Once hand pulling is no longer possible, another option is to cut the tree down near to the ground and either paint or spray the freshly cut stumps with a 25% solution of glyphosate or a 50% solution of triclopyr. Stump treatments can be used as long as the ground is not frozen.

Phragmites Inflorescence



Phragmites Roots

Appendix III (continued)

Common Reed (*Phragmites australis*)

Description

Common reed is a tall, perennial, wetland grass ranging in height from three to thirteen feet. Strong, leathery, horizontal shoots growing on or beneath the ground surface give rise to roots and tough vertical stalks. The leaves of these stalks are alternately arranged, flat and hairless, up to 24 inches long, one half to two and one half inches wide, and tapering to a sharp point. The foliage is gray-green during the growing season, with purple-brown, foot-long plumes appearing on the top of the stem by late June. By fall the entire plant turns tan. Giant cordgrass (*Spartina cynosuroides*), a non-invasive native species, can be confused with common reed. It is distinguished from common reed by its sparse flowering structure and longer, more gracefully arching leaves.

Habitat

Common reed thrives in sunny wetland habitats. It is found along elevated areas of brackish and freshwater marshes and along riverbanks and lakeshores. This plant is particularly abundant in the disturbed or polluted soils of roadsides, ditches, and dredged areas.

Distribution

Common reed may be the most widely distributed plant in the world. It is found throughout the temperate regions of North America. Many Atlantic coast wetlands have been invaded by common reed as a result of alterations to tidal movements by roads and impoundments. It is treated as an exotic species because it invades the habitats of other plants as a result of human alterations to the environment. Moreover, it is strongly suspected that a non-native, aggressive strain of this species was carried to North America in the early twentieth century.

Threats

Common reed has become a destructive weed in North Carolina, displacing desirable wetland plants such as wild rice and cattails. This plant propagates by seeds but once established, it spreads mostly through underground rhizomes. Invasive stands of common reed eliminate diverse wetland plant communities and provide little food or shelter for wildlife.

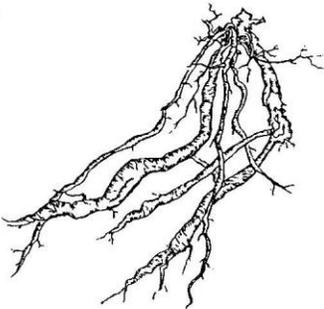
Control

Herbicide use in combination with burning has generally proven to be the most effective means of controlling common reed. Rodeo (a formulation of glyphosate approved for use over

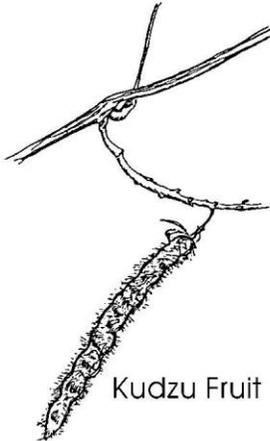
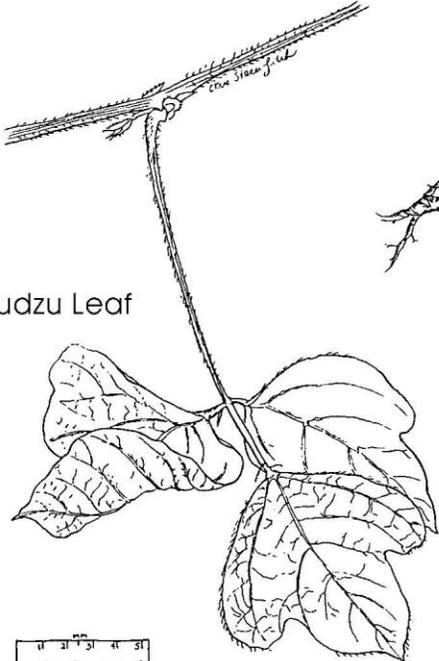
water) should be sprayed on common reed colonies after the tasseling stage (July-September) when the foliage is re-directing nutrients to the roots. Prescribed burning does not reduce the growing ability of phragmites unless root burn occurs. Root burn seldom occurs because the rhizomes are usually covered by a layer of soil, mud, or water. Burning does, however, have the advantage of removing accumulated phragmites leaf litter, giving the seeds of other species area to germinate.

Flooding can also be used to control phragmites when at least three feet of water cover the rhizomes for an extended period during the growing season (usually four months). Cutting the plant in July removes most of the food reserves produced in that season and, therefore, reduces the vigor of the plant. A cutting regime that is carried out on an annual basis may be enough to eliminate a colony.

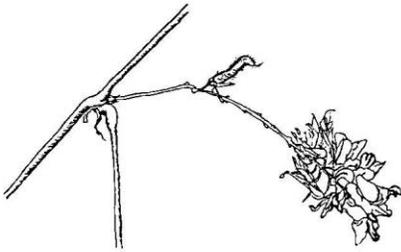
Kudzu Roots



Kudzu Leaf



Kudzu Fruit



Kudzu Flower



Appendix III (continued)

Kudzu (*Pueraria lobata*)

Description

Kudzu is a perennial, trailing, or climbing vine of the legume (bean or pea) family. The compound leaves are broad, up to seven or eight inches long; have hairy undersides; and are arranged in threes at the ends of the stems. With a fragrance reminiscent of grapes, the one half to three quarter inch purple flowers are produced on plants exposed to direct sunlight. Kudzu fruits, present in October and November, are hairy bean-like pods with a few viable seeds in each pod. It is thought that some of these seeds can remain dormant for several years before they germinate.

Young stems of this plant are hairy, while older stems become woody and up to an inch in diameter. From roots that may extend down 12 feet in sandy soils, vines grow upward and runners extend outward. New plants begin at stem nodes every one to two feet. Roots become tuberous, storing as starch the carbohydrates produced by the leaves. These tuberous roots are capable of starting new vines when vines and leaves above ground have been destroyed.

Habitat

Kudzu grows in a variety of habitats and environmental conditions but does best on deep, well-drained, loamy soils. Almost any sunny disturbed area is suitable habitat for this vine.

Distribution

A native of Japan, kudzu was originally brought to the United States for use as animal food. About 50 years ago, it was planted extensively along highways and railroads to stabilize embankments. Now, kudzu has spread along the Atlantic coast, north to Illinois and Massachusetts, west to Texas and Oklahoma, and south to Alabama, Georgia, and Mississippi. In North Carolina, kudzu is a common sight along roadways and bordering agricultural fields.

Threats

Wherever it grows, kudzu has the ability to outcompete and eliminate native plant species. With vine growth of up to one foot a day, it completely overgrows and kills everything from grasses to mature trees in its expanding area.

Control

Eradication of kudzu is not easy and can take up to 10 years for well established stands. Burning kudzu patches in February or early March as well as discing the ground helps prepare an

area for the application of herbicide. Regular cutting may also be sufficient to control most kudzu populations.

The herbicide Transline has been shown to be effective against kudzu. It should be applied during the active growing season in a solution of 0.25% Transline and 0.5% surfactant. This herbicide should not be used near water because of its toxicity to fish and insects. For kudzu near bodies of water, the United States Forest Service recommends Banvel 720 at two gallons/acre for patches less than 10 years old and three gallons/acre for patches greater than 10 years old.

Kudzu can also be controlled by cutting the vines and runners just above ground level and then waiting one to two weeks for foliar resprouting. At this point, the plant can be treated with a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant. This treatment may need to be repeated a couple of times during the growing season for several years before the plant is effectively controlled.

An alternative approach involves the application of glyphosate or triclopyr to cut stumps, foliage, and roots. For vines in tree canopies, cut the vines near the ground and apply a 25% solution of glyphosate or triclopyr to the stumps. Use a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant to treat areas with extensive kudzu ground cover. If possible, locate the tap root and dig or cut into the root crown and apply a 50% solution of triclopyr to the exposed root.

Appendix III (continued)

Multiflora Rose (*Rosa multiflora*)

Description

Multiflora rose is a perennial thorny shrub of medium height. Its arching stems can root at the tip, forming dense thickets of thorny branches. Each compound leaf has five to 11 oval leaflets that are arranged alternately along the stem with a terminal leaflet. The tapering clusters of pungently fragrant, white or pinkish flowers of multiflora rose bloom in June to July. As with other rose species, the fruits are small, red hips containing many seeds in their fleshy interiors.

Habitat

Multiflora rose prefers clearings, roadsides, fence rows, borders of woods, and other open areas. It is adaptable to a wide range of environments but is usually not tolerant of extremely wet or dry habitats. It is, however, invading some bogs and other mountain wetlands in North Carolina.

Distribution

Native to North China, Korea, and Japan, multiflora rose was brought to the United States by horticulturalists in the second half of the nineteenth century. Later, wildlife managers planted it for wildlife food and cover. It was also used for control of soil erosion and on highway medians to reduce headlight glare. Multiflora rose is now found throughout most of the United States.

Threats

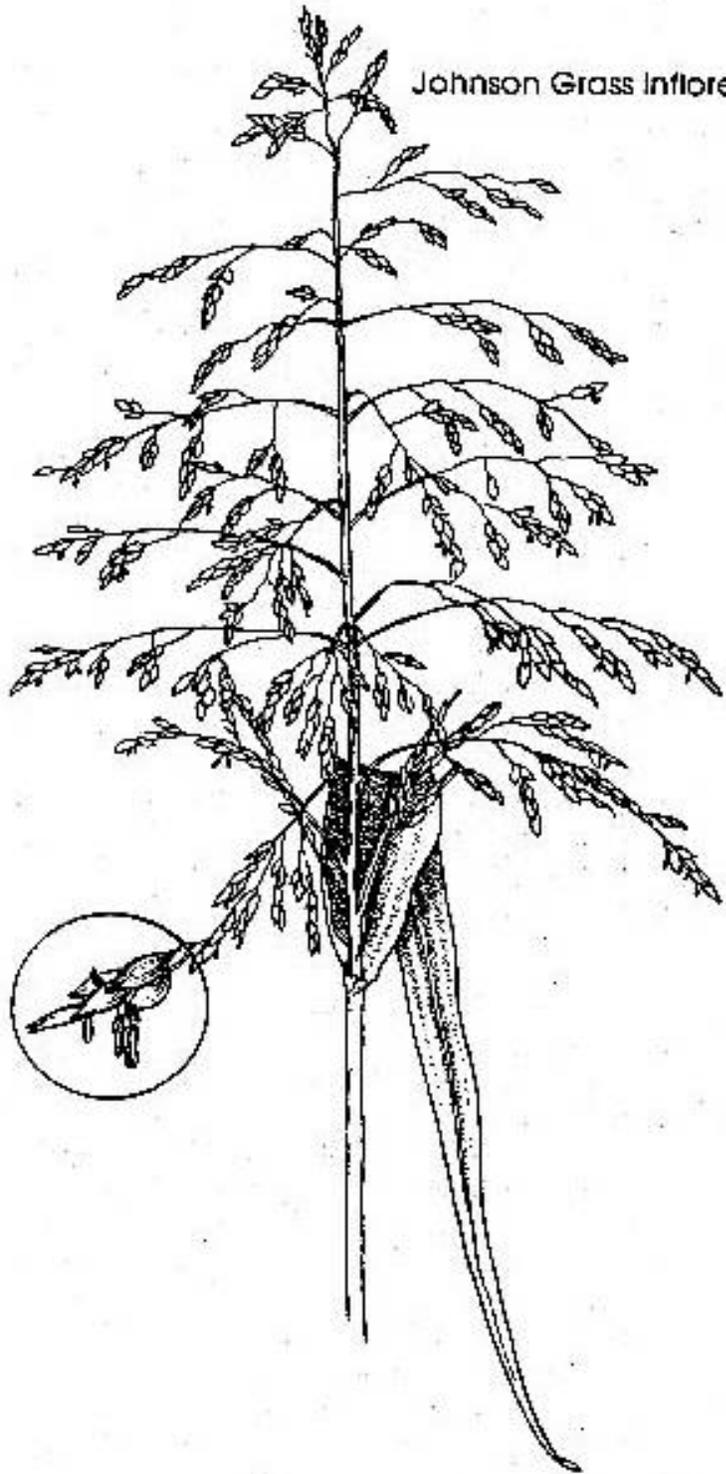
Reproducing by seeds, an average-sized multiflora rose shrub can produce 500,000 to 1,000,000 seeds in a good year. Birds disseminate the seed widely. Multiflora rose forms dense thickets that can choke out native plant species. These thickets form living fences that are impenetrable by large mammals.

Control

Lightly infested areas may be cleared with a shovel or hoe provided that the entire root is removed. In heavier infestations, three to six cuttings or mowings per year near the ground for two or more years will give high mortality. In some situations, a prescribed fire during the early growing season may be an appropriate method of control. As with mechanical methods of control, it may be necessary to annually burn for several years to completely kill this plant.

Glyphosate and triclopyr are probably the most effective herbicides for controlling multiflora rose. Apply a solution of 2% glyphosate or triclopyr and 0.5% nonionic surfactant to thoroughly wet all leaves. The air temperature should be above 65°F to ensure absorption of the herbicide. In addition, the stems of multiflora rose can be cut at or near ground level and then immediately be treated with a 25% solution of glyphosate or triclopyr. This treatment remains effective at low temperatures as long as the ground is not frozen. The basal section of the plant (ground to 12 inches) can also be treated with a solution of 25% triclopyr and 75% horticultural oil. After treatment, wet the area thoroughly.

Johnson Grass Inflorescence



Johnson Grass Roots

Appendix III (continued)

Johnson Grass (*Sorghum halapense*)

Description

Johnson grass forms dense clumps and can grow to a maximum height of eight feet. It has long, smooth leaves with a characteristic white mid-vein. The stems of this grass are often pink to rusty red near the base and the inflorescence is large and loosely branched.

Habitat

Johnson grass thrives in cultivated and abandoned fields, forest edges, stream banks, roadsides, vacant lots or any disturbed ground.

Distribution

Johnson grass was introduced to the United States from its native range around the Mediterranean Sea. It has spread to most temperate regions of the world and is found extensively in North Carolina.

Threats

A major agricultural weed, Johnson grass is especially troublesome in corns fields where it forms tall, dense stands. It also aggressively crowds out native species along riverbanks and along the edges of woodlands.

Control

Johnson grass can be a challenging plant to control since when this grass is cut it can resprout from underground rhizomes and it is resistant to many common herbicides. Moreover, spring burning encourages regrowth. Small stands of this grass can be controlled by hand-pulling when the soil is moist. Repeated winter tilling to expose and kill root material has been successful at controlling larger infestations.

The application of a 2% solution of glyphosate near the end of the growing season (just prior to seed maturity) when this grass is transporting nutrients to its roots results in a high rate of mortality. The herbicide may be applied to the leaves or freshly cut stems. Increase the concentration of glyphosate to 20% if it is applied to cut stems. These treatments must be repeated for several years to eradicate the seed bank.

Reference for Appendices IV, V and VI

North Carolina Department of Agriculture and Department of Environment, Health, and Natural Resources. Aquatic Weed Control Act of 1991 and Regulations. Raleigh, NC

North Carolina Department of Agriculture. State Noxious Weed List (Revised February 7, 1996). Raleigh, NC

North Carolina Department of Agriculture. 1994. Regulations for State Noxious Weeds. Raleigh, NC