Stream Buffers and Streambank Restoration by
What is a Stream?
Ephemeral Streams

- Only flows during and shortly after precipitation.
- These streams do not have wrested vegetation.
- They do not require stream buffers in Georgia.
This Ephemeral Stream/Ditch shows signs of a Head Cut working upstream.
Intermittent Streams

- Flows for part of the year.
- These streams have wrested vegetation.
- They require stream buffers in Georgia.
- They may have bed features and perennial pools.
- They provide habitat for juvenile aquatic life.
Intermittent Stream
Perennial Streams

- Flows year round.
- These streams have wrested vegetation.
- Sinuous Pattern.
- They have bed features, Riffles & Pools.
- Evidence of fluctuation high-water marks.
- Evidence of Sediment Transportation.
- Hydric Soils
- They provide habitat for Algae, Benthic Macroinvertebrates, Fish & Amphibians.
- They require Stream Buffers in Georgia.
Perennial Stream
Rosgen Stream Classification

LONGITUDINAL, CROSS-SECTIONAL and PLAN VIEWS of MAJOR STREAM TYPES

- DOMINANT SLOPE RANGE
  - Aa+: >10%
  - A: 4-10%
  - B: 2-4%
  - C: <2%
  - D: <4%
  - DA: <0.5%
  - E: <2%
  - F: <2%
  - G: 2-4%

- CROSS SECTION VIEW

- PLAN VIEW

- STREAM TYPES
  - Aa+
  - A
  - B
  - C
  - D
  - DA
  - E
  - F
  - G
Stream Buffers

State

- Warm Water = 25’ Stream Buffer
- Trout Stream = 50’ Stream Buffer
- State Buffers measured from Wrested Veg.
- EPD Field Guide for Determining State Waters that Require a Buffer
EPD Field Guide

WRESTED VEGETATION

Examples of situations that usually do not require a buffer due to lack of wrested vegetation:
1. Freshwater Wetlands
2. Concrete Channels
3. Brick/Brick, Seawalls or Retaining Walls
4. Rip Rap
5. Vegetated Waterways (including aquatic vegetation)
6. Impoundments with completely vegetated banks

Note: Sometimes the identification of trees may require a buffer if vegetation has been modified.

DEFINITIONS

a. "Base Flow" means the discharge that leaves a stream channel mainly from groundwater, and also from lakes during periods when no precipitation occurs.

b. "Buffer" means the area of land immediately adjacent to the banks of State Waters in its natural state of vegetation, which facilitates, when properly vegetated, the protection of water quality and aquatic habitat (O.C.G.A. 12-7-3.2)

c. "Perennial Streams" means a stream that typically has no well-defined channel, and which flows only in direct response to precipitation with runoff (O.C.G.A. 12-7-6(9.5))

d. "Intermittent Stream" means a stream that flows in a well-defined channel during wet seasons of the year but not for the entire year.

e. "Land Disturbing Activity" means any activity which may result in soil erosion and the movement of sediments into State Waters or onto lands within the State, including but not limited to grading, dredging, grading, excavating, transporting, and filling of land, but not including those practices to the extent described in O.C.G.A. 12-7-17 (O.C.G.A. 12-7-5.5)

f. "Normal Stream Flow" for non-trout waters only, means any stream flow that occurs solely of base flow or consists of both base flow and direct runoff during any period of the year. Base flow results from groundwater that enters the stream channel through the soil. This includes spring flows into streams. Direct runoff is the water entering stream channels promptly after rainfall or snow melt (House Bill 391, 3-7-01(R6))

g. "Perennial Stream" means a stream that flows in a well-defined channel throughout most of the year under normal climatic conditions

h. "State Waters" means any and all rivers, streams, creeks, brooks, branches, inlets, marinas, ponds, drainage systems, springs, wells, and other bodies of surface or subsurface water, natural and artificial, lying without or forming a part of the boundaries of the State which are not entirely confined and contained completely upon the property of a single individual, partnership, or corporation, except as may be defined in O.C.G.A. 12-7-3(36) (O.C.G.A. 12-7-3.1)

i. "Stream Bank" means the contouring cut of a stream channel and is usually identified as the point where the normal stream flow has eroded the vegetation (House Bill 391, 3-7-01(R6))

j. "Wrested Vegetation" means movement of water that removes soil, debris and vegetation, creating a clear demarcation between water flow and vegetative growth.

Field Guide for Determining the Presence of State Waters That Require a Buffer

This guide is based on the rules for Erosion and Sedimentation Control (Rules), 391-1-37, promulgated under the Georgia Erosion and Sedimentation Act (O.C.G.A. 12-7-2).

This guide only addresses the identification of rivers, streams, creeks, brooks, branches, canals, and impoundments that may require a buffer. The State maintained buffer requirements apply to State Waters that have wrested vegetation by normal stream flow. Coastal marshlands are addressed in a separate document and have state-maintained buffers that are measured from the jurisdictional Delineation (JDO) line established by the Coastal Marshland Protection Act and implemented by the Coastal Resources Division (CRD).

For the purposes of this guide, Normal Stream Flow is defined as "any stream flow that occurs solely of base flow or consists of both base flow and direct runoff during any period of the year. Base flow results from groundwater that enters the stream channel through the soil. This includes spring flows into streams. Direct runoff is the water entering stream channels promptly after rainfall or snow melt." This definition is found in the definition of Stream Bank in the Rules, and only applies to non-trout streams. Streams that have No Normal Stream Flow as defined in the Rules have features that are not normally associated with ephemeral streams.

Please note the following:

1. The definition of Normal Stream Flow that appears in the guidance applies only to non-trout streams. Ephemeral stream flows are not exempt from buffer requirements, but may be eligible for the General Stream Buffa Variance (391-1-37-3.5) for the Erosion and Sedimentation Control Rules. Refer to the Georgia Water Quality Control Rules (391-5-83.01) for a listing of trout streams. DNR Wildlife Resources Division trout maps should not be used.

2. Ponds, lakes and other impoundments located within a stream watershed may be subject to trout stream buffer requirements (20 feet buffer).

3. Detention, retention, and other water quality/water quantity ponds may be subject to buffer requirements.

4. Drinking a pool may not eliminate the buffer. In addition, if the pool is abandoned after the cure buffer will be based on the new conditions of the feature, i.e., instead of a buffered pond there may be a buffered stream.

5. The buffer or an impoundment is measured from the point of "wrested vegetation." Normal pool elevation should not be used unless it coincides with the point of "wrested vegetation."

6. The buffer is 25 to 50 feet as measured horizontally from the point where "wrested vegetation has been wipped by normal stream flow or wave action."

7. Buffer requirements are included in the General NPDES Permit for Storm Water Discharges Associated With Construction Activities.

8. Agricultural activities, such as the cultivation and harvesting products of the field or orchard, planting of mature land, construction of a pond for agricultural purposes, dairy operations, and livestock and poultry operations, are exempt from the buffer requirements (O.C.G.A. 12-7-17.5). However, the construction of agricultural buildings, such as poultry houses may be subject to the buffer requirements included in the NPDES General Permit for Stormwater Discharges Associated With Construction Activities.

9. Contact DNR, Coastal Resources Division for guidance involving any land disturbing activity within the coastal marshland itself.

10. State Waters may also be classified as Waters of the U.S. and may require a U.S. Army Corps of Engineers Section 404 permit.

Contact Information:
Georgia Environmental Protection Division
Water Quality Protection Branch
Northside Source Protection
2 Martin Luther King Jr. Drive
Suite 104/C Floor 1
Atlanta, Georgia 30334
404-656-8611
www.epd.georgia.gov

The publication of this document was supported by the Georgia Department of Resources, Environmental Protection Division and was financed in part through a grant from the US Environmental Protection Agency under the provisions of Section 505(a) of the Federal Clean Water Act of 1987, as amended.

April 2017
EPD Field Guide

STEPS FOR DETERMINING THE PRESENCE OF STATE WATERS AND BUFFER REQUIREMENTS ON A SITE

Please note that this guidance is primarily written to assist local issuing authorities with their determinations of State waters and buffer requirements. However, it is also used for pre-plan preparation and environmental consultation to use in the preparation of accurate EIS/IS and Pollution Control Plans.

Step 1

1. Review the topography of the Erosion, Sedimentation, and Pollution Control Plan for natural or artificial features that may indicate the presence of State Waters.

Step 2

2. Walk the entire length of the river, stream, creek, brook, or canal until you visit the property to verify that the feature is not completely contained upon the property of a single individual, partnership, or corporation. If the feature is an impoundment then the property should be inspected for an impoundment and/or pollutant property lines identified as rectify that the feature is not completely contained upon the property. If a feature is completely contained upon the property of a single individual, partnership, or corporation, and there is no in-stream, then the feature is not a State Water and is not buffered.

Step 3

3. If it is determined that the feature is a State water the next step is to determine if the feature is a buffered State water. This involves determining if the feature has riparian vegetation and base flow. The buffer determination should be made at least 40 hours after the last rain event to accurately identify base flows.

Step 4

4. The feature should first be inspected for riparian vegetation. If there is no point of riparian vegetation, the feature is not buffered. The absence of riparian vegetation can be due to completely vegetated banks and/or locomotion of aquatic vegetation, up-rap or a solid boulder, seawall, or existing wall.

Step 5

5. If there is flowing water in the uesed vegetated channel 48 hours after a rain event the feature is either perennial or intermittent and will require a buffer. If there is no water in the channel for the feature to be located in a stream or riparian area, the feature is not a State Water.

Step 6

6. Further investigation is required if the feature has riparian vegetation and is dry at the time of the site inspection. In such conditions inspections should be accompanied by professionals trained or otherwise familiar with methods used to determine whether the stream is a source where base flows may be observable, or if the stream is ephemeral and flows directly in response to precipitation.

Step 7

7. The most current version of the “North Carolina Division of Water Quality Stream Identification Method” should be used to verify whether the stream is ephemeral. For impoundments test foil should be dug up prior to the high water mark and a few inches below the elevation of the existing water level. The water level in the test hole should stabilize at the same elevation of the subject feature if there is a ground water component.

Step 8

8. If it is determined that there is both riparian vegetation and base flow present on the site then a State-standared buffer is required and the buffer is measured from the point of riparian vegetation. Please note, and ephemeral streams are buffered regardless of the presence of base flow.

Step 9

9. The determination should be documented in writing. Photo documentation is strongly recommended.

PERENNIAL STREAM CHARACTERISTICS

Coastal Perennial

North Georgia Perennial

Pleistocene Perennial

Coastal Intermediate

North Georgia Intermediate

Pleistocene Intermediate

Coastal Ephemeral

Perennial streams flow throughout the year in a natural climatic year. Site inspections should record in visually discernible stream flow as evidence of base flow contribution between rain events, or in low flow conditions. After confirming perennial flow requires the presence of one or more of the following characteristics indicating that the drainage feature is a perennial stream:

1. Base flow that maintains stream flow throughout the year under normal circumstances.
2. Well-developed stream banks and channels include riffles/pools.
3. A channel that is almost always submerged (wading, snorkeling, etc.) in a flood plain or channel. Examples include eddies, ridges, riffles, pools, and the emergent grasses, sedges, and other vegetation.
4. Exposure of rock or gravel or sand in a continuous or nearly continuous low-flow channel.
5. Stream bank soils with hydric conditions, including dominant Blackgley (graminoid) and/or wetland-woody features evident in the exposed stream bank profiles or in the low flow conditions.
6. Presence of aquatic mollusks, crayfish, amphibians, aquatic insects (in any life phase) or fish (or other identifying insects or aquatic, see the GA Adopt-A-Stream Aquatic Macroinvertebrate Field Guide, [www.georgiawild.org/wildlife/aquatic])

EPHEMERAL STREAM CHARACTERISTICS

Coastal Ephemeral

North Georgia Ephemeral

Pleistocene Ephemeral

Ephemeral streams usually have poor channel development and lack groundwater, induced base flows that normally result in hydric soils dominating the banks of intermittent and perennial streams.

The periphyton for a culture feature to be classified as ephemeral there must be no evidence of base flows in the stream bank (we use methods described in intermittent stream characteristics). After meeting the periphyton above, the presence of one or more of the following characteristics indicates that the drainage feature is an ephemeral stream:

1. Poorly developed stream banks.
2. Absence of riffles or pools.
3. A flow area that is almost always straight and either “flattens” out at the bottom of the slope or grades into intermittent or perennial streams.
4. Absence of biofilms or algal mats in the streambed.
5. An abundant amount of leaf litter in the flow areas. Usually sparse or no algae and/or wetland (hydric) vegetation present.
6. Tolerates both aquatic and upland plants in the riparian.
   Side slope soils with vegetation typical of the surrounding landscape.
   Soil texture usually more heavy than the surrounding upland landscape and usually has a clay subsoil.
Stream Buffers

Local

- Check with Local Municipality as some use Top of Bank versus Wrested Vegetation.
- Larger buffers required as much as 7 miles upstream of water intakes.
Stream Buffers

- Forsyth County
  - 50’ Buffer from top of bank on intermittent and perennial streams.
  - 75’ Impervious setback from top of bank.
Stream Buffers

Alpharetta

- Intermittent
  - 50’ Buffer from Wrested Veg.
  - 75’ Impervious setback.

- Perennial
  - 100’ Buffer from Wrested Veg.
  - 150’ Impervious setback.
Past Agricultural Practices: Planting corn along a river.
Northeastern Tennessee, May 1940
Note: Little to No Stream Buffer
Regulating Authorities

- **Federal – U.S. Army Corps of Engineers**
  - Nationwide Permitting
  - US Fish and Wildlife, Cultural Resources, EPA, Historic Society & National Parks
- **State – GA EPD**
  - State Buffer Variance
- **Local – City and/or County**
  - Local Land Disturbance Permitting
- **HOA, etc.**
  - Regulation by Covenants
Permitting

- **Federal – U.S. Army Corps of Engineers**
  - Two options
    - Nationwide Permit (NWP 13 & 27 for Stream Restoration)
    - Individual Permit (very difficult and for large permits)
    - NWP 45-day process but requires expertise in permitting to know how to use the NWPs
    - Requires monitoring after construction

- **State – GA EPD**
  - State Buffer Variance
  - 120-day process (Requires detailed Erosion and Sediment Control plans and replanting plans)

- **Local – City and/or County**
  - Local Land Disturbance Permitting
  - May require filing for a Variance before submittal of LDP documents

- **HOA, etc.**
  - Regulation by Covenants

Call the experts at Corblu Ecology Group for permitting.
Streambank Stabilization vs. Stream Restoration

- Discouraged Practices (Hard Armoring)
  - Riprap
  - Gabions
  - Bulkheads and Seawalls
- Temporary
- Does not reconnect stream to floodplain
- Does not address the problem.

Streambank stabilization practices listed as per “Streambank and Shoreline Stabilization” Guidance Book, Revised April 2011, by Georgia EPD and the Georgia Soil and Water Conservation Commission (GSWCC).
The Evolution of Streambank Stabilization
Riprap placed without first determining the problem.
Gabion Baskets
Question:
Do you need a Stream Buffer Variance?
Is a Stream Buffer Variance Required?
Streambank Restoration using Natural Channel Design
E303’s Recommendations

* Master Planning
  1. Establish Preliminary Assessment and Restoration Goals
  2. Overall Watershed Assessment
     a. Maps & Aerial Photos
     b. Stream Walk and Photo Journal
        a. Landowner Coordination
        b. Identify and Trace Potential Issues
        c. Revisit and Refine Restoration Goals
E303’s Recommendations

* Master Planning

3. Prioritize areas for remediation

4. Develop a plan for the Short and Long Term
   - Identify areas in need of immediate attention
   - Budget for the long term
   - Always Work from Upstream to Downstream
Incised / Entrenched Rivers
(Total Lack of Connection to the Floodplain)
Raccoon Creek: Dallas, GA
10’ Vertical Streambank Endangers Transmission Tower
Accelerated Bank Erosion
Sediment is our largest pollutant.
This is an extract from a Streambank Erosion Study by E303.

The stream was an F5 channel located in Columbia County, GA.

The study involved 3,952 feet of streambank that yielded 850 tons of sediment per year.

A stream restoration of this project could reduce a minimum of 750 tons of sediment from the stream per year.
Bankfull Bench
With Transplanted Alders and Live Willow Stakes
Water Quality

Before

After
Coosa River

Photo taken at confluence just below stream restoration project during a flood. Note there is less sediment in the restored stream.
What is a Healthy Stream?

- Connected to the floodplain at bankfull.
- Deep rooted vegetation along stream banks
  - Soil Stability
  - Habitat
- Healthy Riparian Buffer
  - Remove Invasives
    - Chinese Privet
    - Mimosa, English Ivy
    - Kudzu, Multiflora Rose
Planting
Root Mass is Mother Natures Rebar

Zone A
- Base Flow Channel
- Soft Rush and Reeds
- Riparian Seed Mix

Zone B
- Streambank
- Black Willow, Tag Alder, Elderberry, Silky Dogwood

Zone C
- Bankfull / Flood Prone
- Water Oak, River Birch, Sycamore, Witch-Hazel
Toe Wood-Sod Mats with Woody Debris

- Stabilize Streambanks
- Enhance Fish Habitat
- Maintain a Low Width/Depth Ratio
Plan View of Toe Wood and Woody Debris Prior to Installing Sod Mats. Logs are Submerged.
Plan View of Toe Wood-Sod Mats w/ Woody Debris & Vegetation Cover. Wood is submerged and counter-weighted so that 80% of wood is covered & integrated with bank.
Toe-Wood Sod Mats with Woody Debris: Cross-Section View of Existing vs. Proposed
Toe Wood Installation

Divert creek away from work area

Under-cut creek bed 3 to 4 feet
Toe Wood Installation

Footing Logs

Root Wads
Toe Wood Installation

Add Woody Debris and Willow Cuttings

Cover with Geo-Textile Fabric
Add more Willow Cuttings
Coosa Mitigation Bank: Rome, GA
Natural Channel Design

Head Cut Works on Poor Design

Log J Hooks with Alder Transplants
Log J Hook
After 5 Bankfull Events and 1 Flood of Record
(Project was constructed in April 2009.)
Cross-Vane Diversion
Middle Fork
Little Snake River, CO
W-Weir at Bridge with Center Pier
South Platte River, CO
Bridge Protection Structure
Cobb County, GA
Log Cross Vane
Used to redirect flows to the center of the stream.
Utility Protection Design

The sanitary sewer was encased in the concrete dam.
The redesign drained the pond and used a rock vane to protect the aerial sanitary sewer.

The drained pond was converted to a wetland and provides both water quality and flood storage.
Stream Relocation to Protect Power Substation

Georgia Power Roswell Substation Restoration Before and After Photos

Streambank Restoration project located in the City of Roswell, Fulton County, Georgia, on Riverside Creek No.1. Drainage basin at this site is 1.80 sq. miles.

Contacts:
- Designer: Engineering303, LLC.: Brian King 770.442.0590
- Contractor: C.S. Britton, Inc.: Scott Britton 770.490.6581
- Ga. Power Environmental Affairs: Brian Estes 404.799.2110

The existing stream had cut & exposed the sanitary sewer & at the same time changed direction & eroded to the Sub-Station.

Design goals were accomplished through the use of Natural Channel Design Principles:
1. Protect the structural integrity of the Power Sub-Station
2. Stabilize the Streambank
3. Reconnect stream to flood plain
4. Protect the Sanitary Sewer

Note: This project was live staged after these photos were taken.
Where do I put the Silt Fence?
If you get it right, we can all enjoy our streams!
Importance of Wetlands for Flood Control

- [https://www.youtube.com/watch?v=ucb-Y8iipng](https://www.youtube.com/watch?v=ucb-Y8iipng)

Why Stream Meander

- [https://www.youtube.com/watch?v=8a3r-cG8Wic](https://www.youtube.com/watch?v=8a3r-cG8Wic)

Woody Debris Jam and Fish Habitat