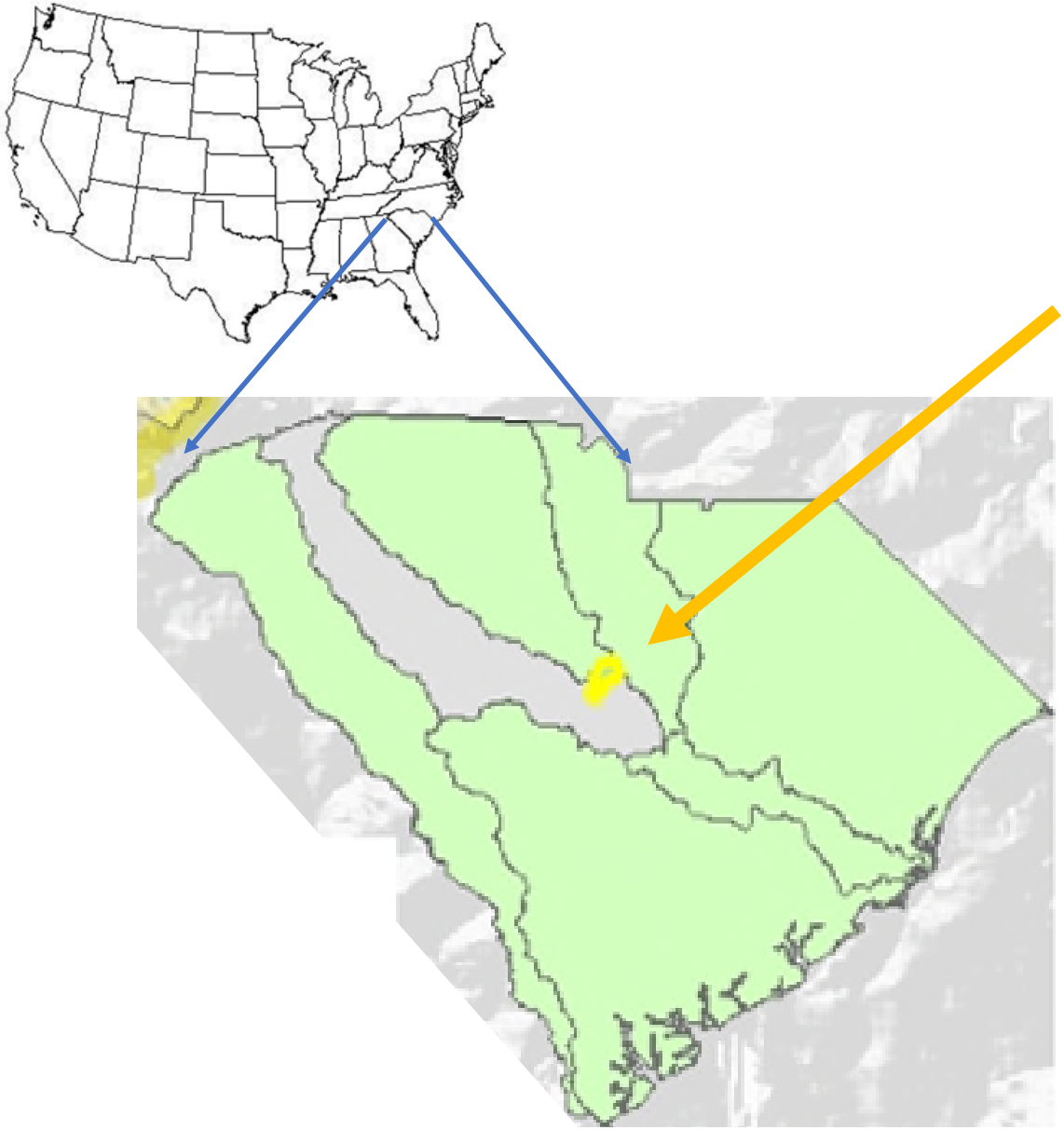
GILLS CREEK, COLUMBIA, SC

RECLAMATION ENHANCEMENT PROJECT FOLLOWING 1000-YEAR FLOOD EVENT IMPACTS

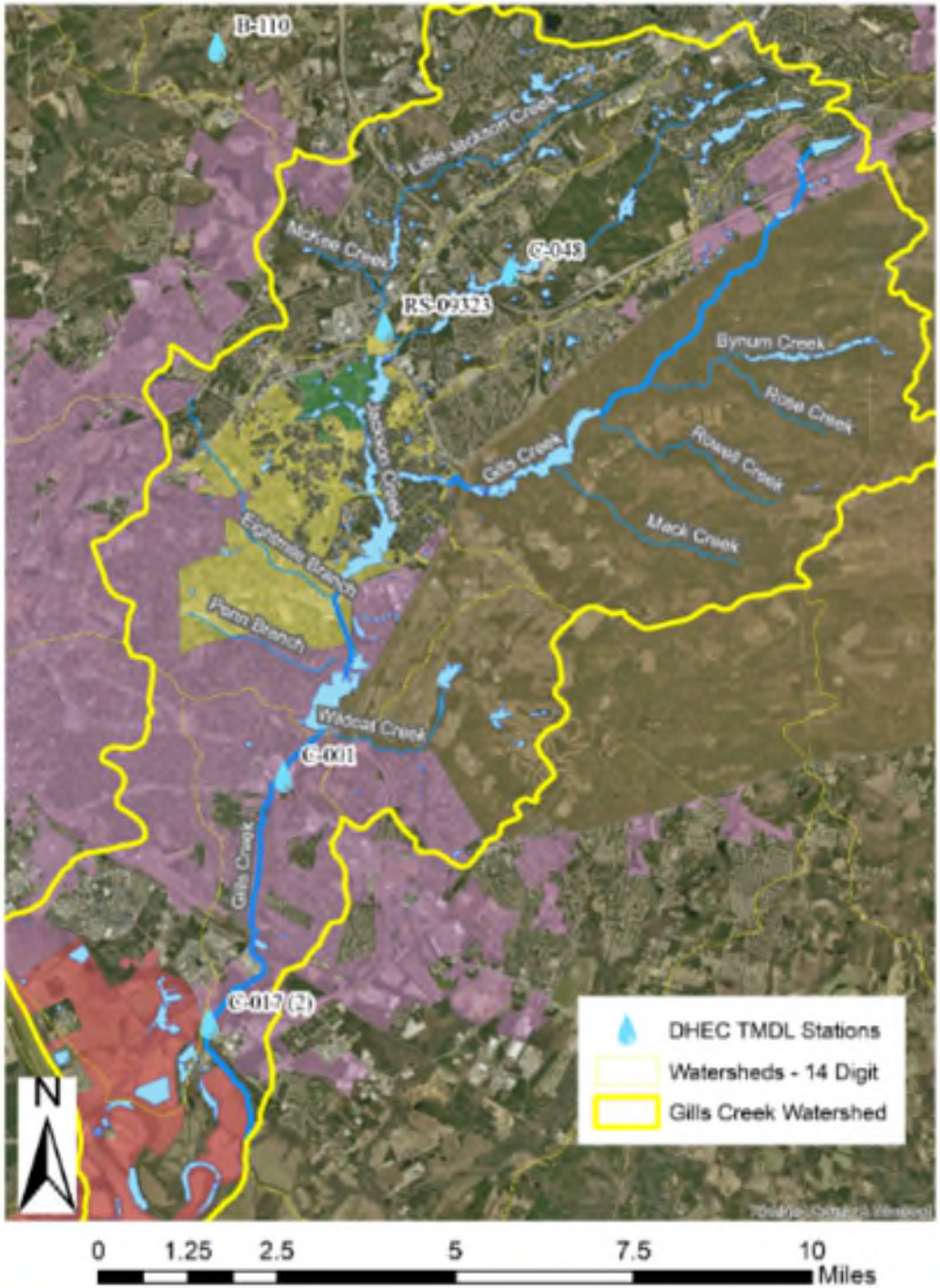
Gwen Geidel, USC

Tom Kohlsaat, GCWA



SCDHEC Rpt 011N-18

The Gills Creek Watershed (GCW) in Columbia, SC, is an impaired urban watershed within the Saluda River Basin.



Gills Creek Watershed

- 19,500 ha (76 mi^2),
- over 140 miles of stream,
- population >111,000,
- 55.8% 2010 (74% 2020) urban land; the highest percentage of urban land of any watershed in SC.

Sub-watersheds

- HUC 12
- Jackson Creek-Gills Creek
  - 19.3 sq. miles
  - Richland County
- Upper Gills Creek- Congaree River
  - 22 sq. miles
  - Primarily Fort Jackson
- Lower Gills Creek-Congaree River
  - 33 sq. miles
  - Includes City of Columbia and Forest Acres

1000-year Flood, 18” of rain in 24 hrs in GCW in Oct 2015

- Mean October precipitation is 3.16 inches
- The Gills Creek Watershed (GCW) was severely impacted by a 1000-year flood in October 2015, when over 46 cm (18”) of rainfall fell in 24 hours causing the breaching of at least 6 dams, extensive property damage, and loss of life.

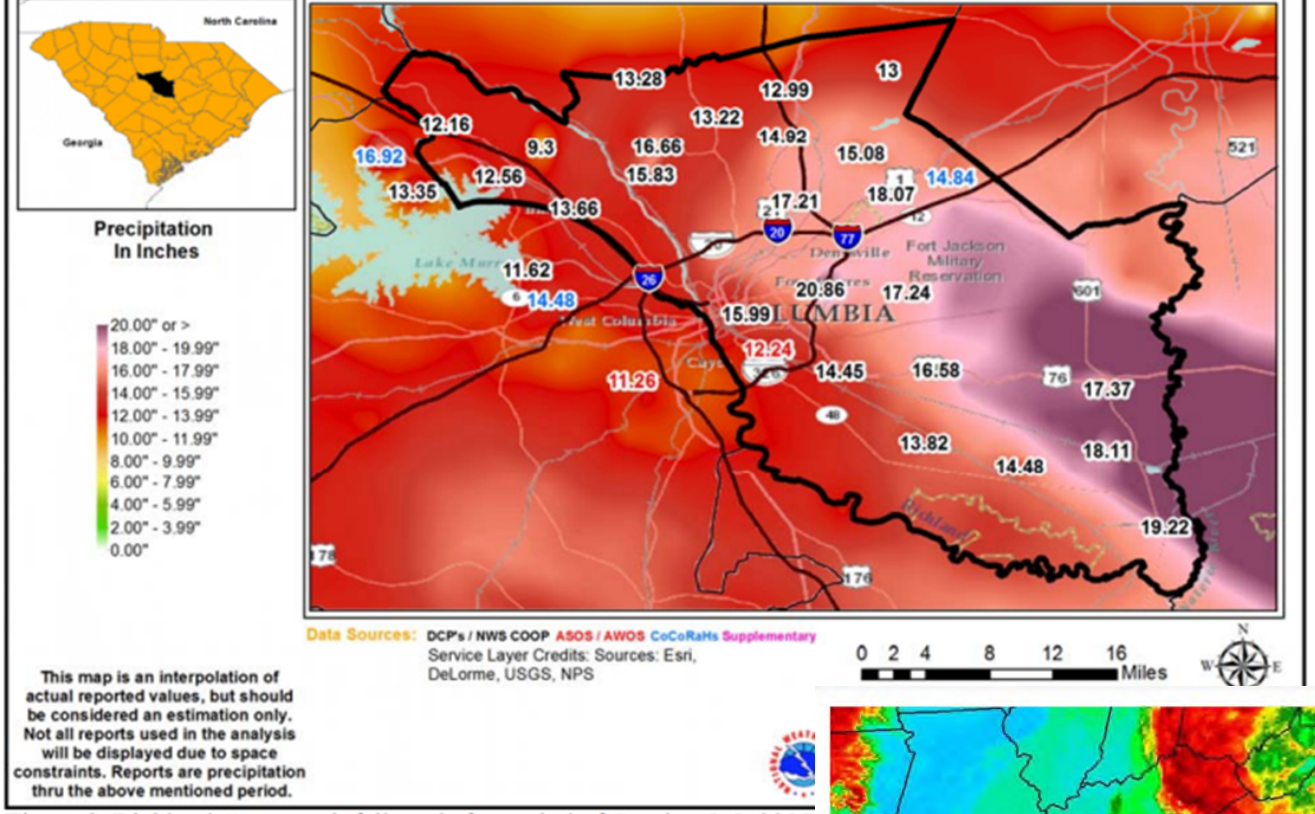


Figure 8. Richland County rainfall totals for period of October 1-5, 2015 as background and individual values based on ground measurem (http://noaa.maps.arcgis.com/apps/MapJournal/?appid=2d473e3

After a saturating rain from Sept 24-29 of 1-4”

SC Storm Total Rainfall Ending 7 AM 10/5/2015; GCW 14-20”

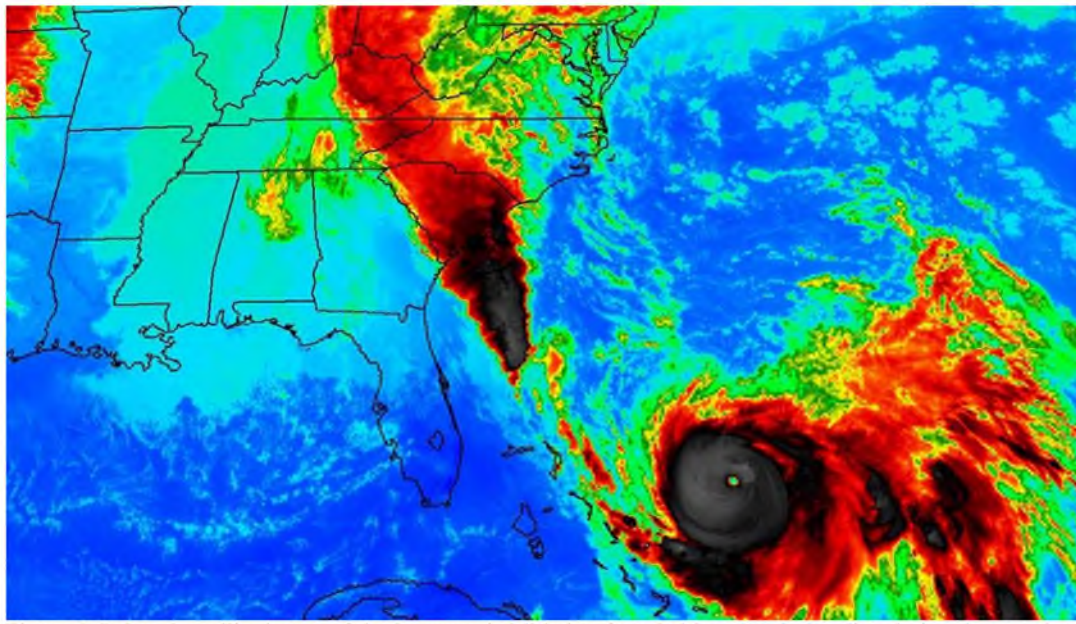
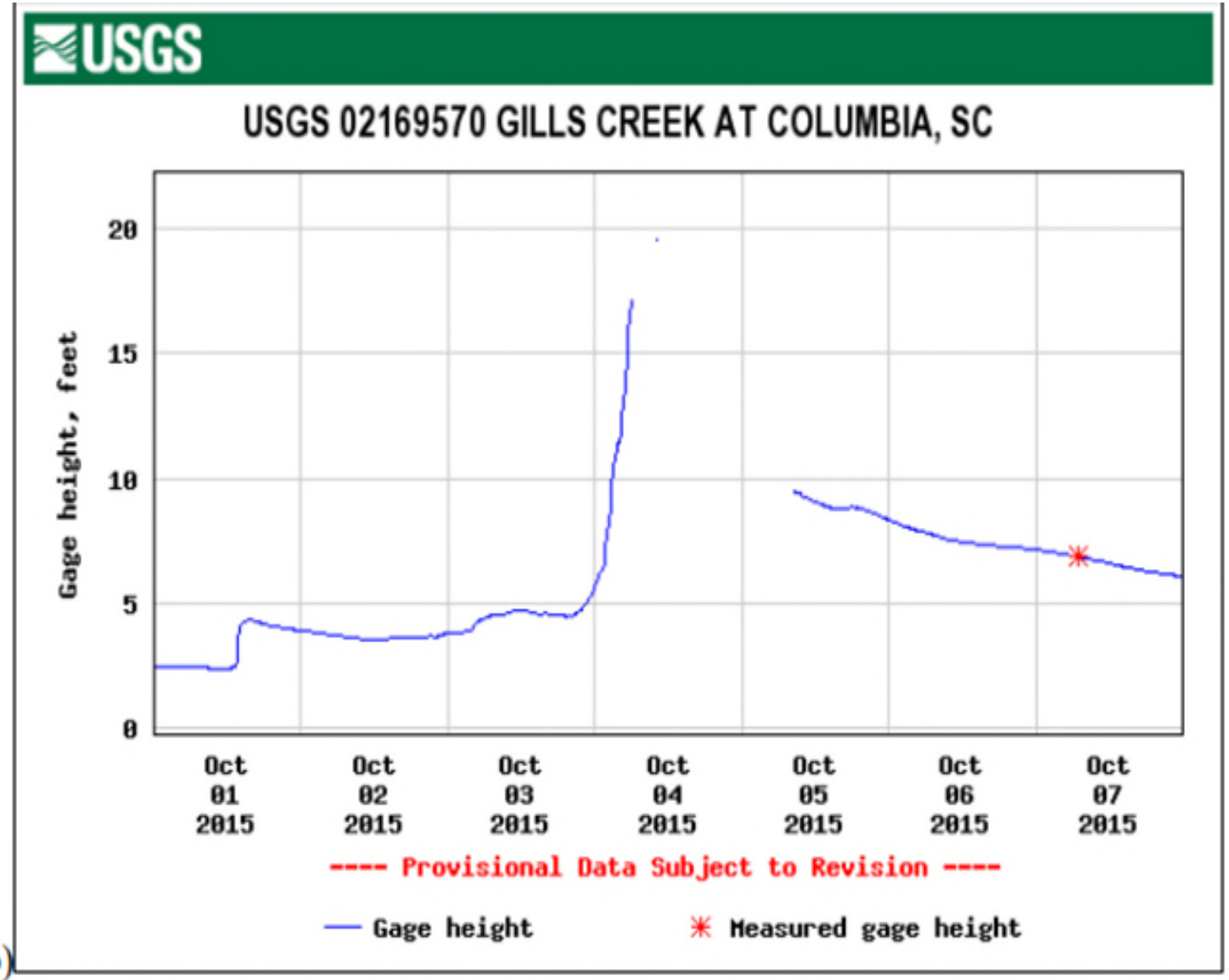


Figure 5. Infrared satellite image of the intense rainfall being funneled into South Carolina during the morning October 3, 2015. Note the location of Hurricane Joaquin. (http://www.weather.com/news/news/stunnir meteorological-images-october-2015-flooding, NASA).

Oct 3, 2015, AM rainfall

The Storm

- Over 16” of rain fell in Gills Creek Watershed
- Over 8” of rain fell in an 10 hour period
- Gills Creek gauge measured at 19.6 feet on 10/4/15
  - Previous peak streamflow: 8.7 feet (1979)
  - Gauge overwhelmed/damaged
  - 9.11 feet = 2,380 cfs



(b)

Figure 70. Gills Creek USGS gauge 02169570 located at the US-378 Bridge over Gills Creek 1 km downstream of Lake Katherine: ; (b) stage with a last recorded data point of 17.08 ft (15.46 ft NGVD 29) at 6:00 EST on October 4, 2015, a single recorded data point of 19.57 ft (156.95 ft NGVD 29) at 10:00 EST on October 4, 2015 and no data thereafter until 08:30 EST October 5, 2015 (waterdata.usgs.gov/nwis).

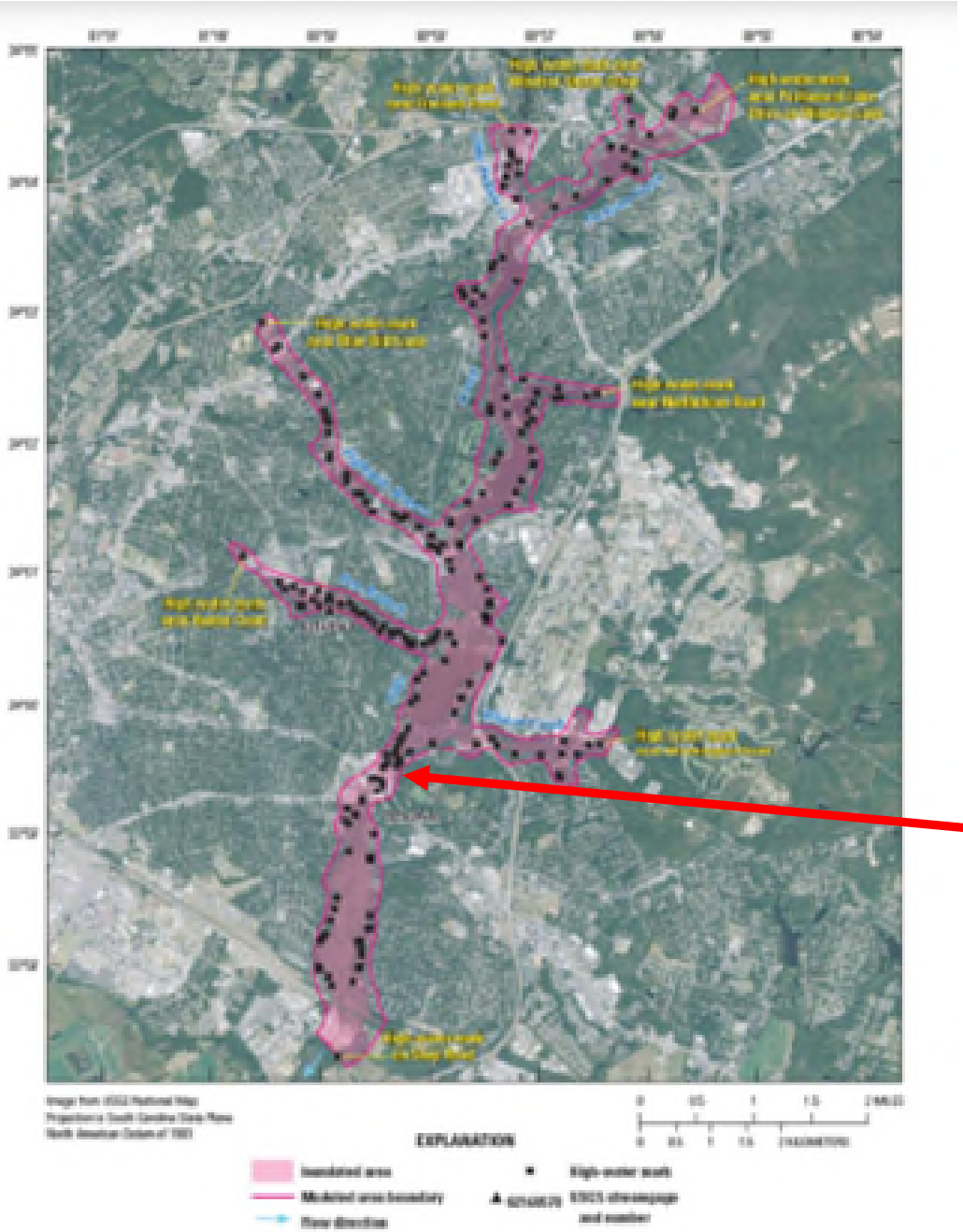
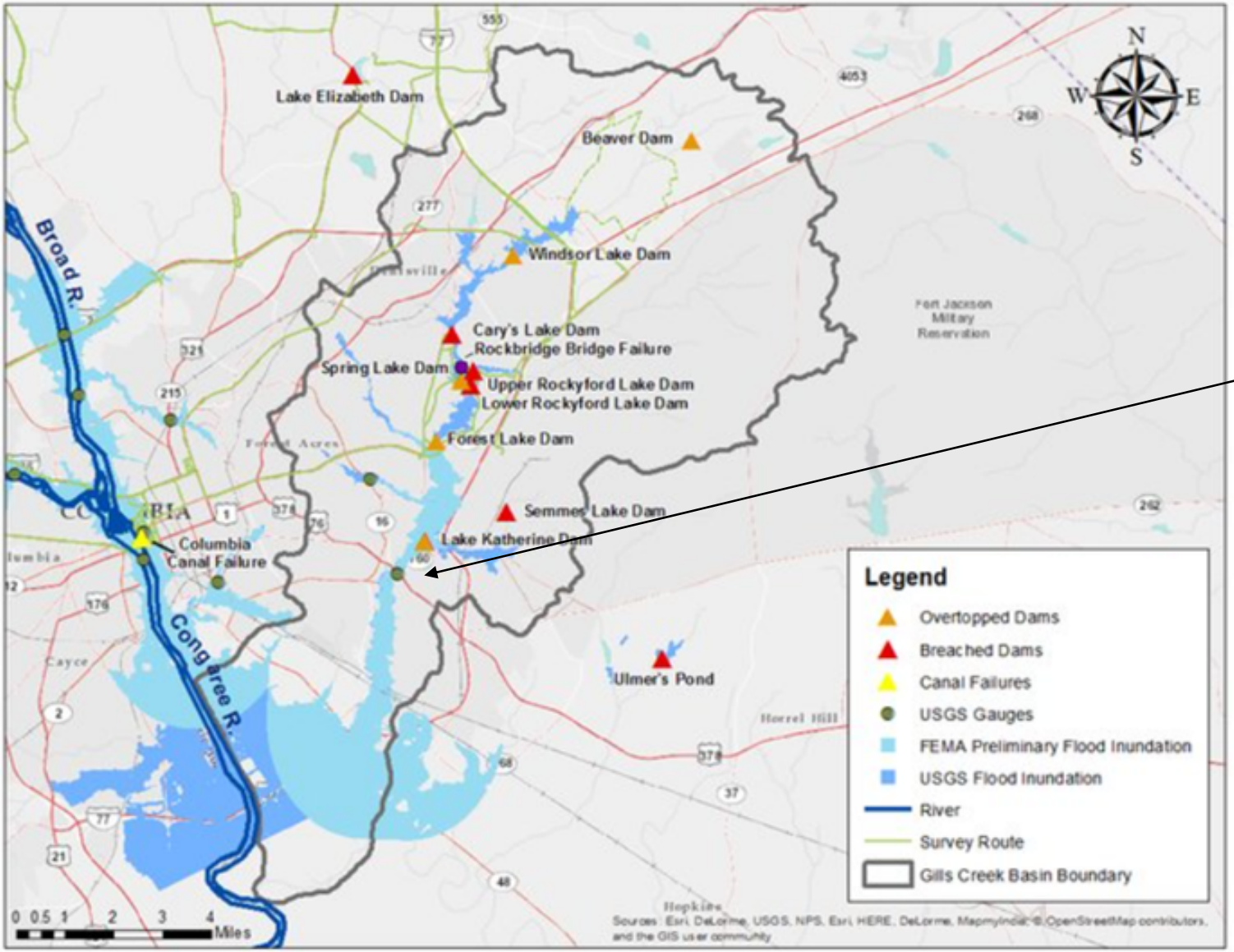


Figure 71. Flood-inundation map of Gills Creek in Columbia, South Carolina, October 1–5, 2015 (Musser et al, 2016, USGS).

Crowson Road and
US 378 (Devine Street)



Gills Creek watershed boundary with an overlaid GPS track with distressed and breached dams covered during the GEER field survey from October 11 to 14, 2015.

Fritz, et al, 2016, Figure 69.

US 378 looking East;
Gills Creek – east of blue roof (TitleMax building). 10/4/15.
Crowson Rd to left, near Green roof

Credit: AP

Floodwaters rush through Gills Creek on Devine Street in Columbia, S.C., Monday, Oct. 5, 2015 on Devine Street. (AP Photo/Chuck Burton)

WLTX.com, 2019

Figure 5: Conditions at U.S. Geological Survey streamgaging station 02169570, Gills Creek at Columbia, SC, on October 5, 2015. *Source: USGS*

US 378 – Devine St – looking West

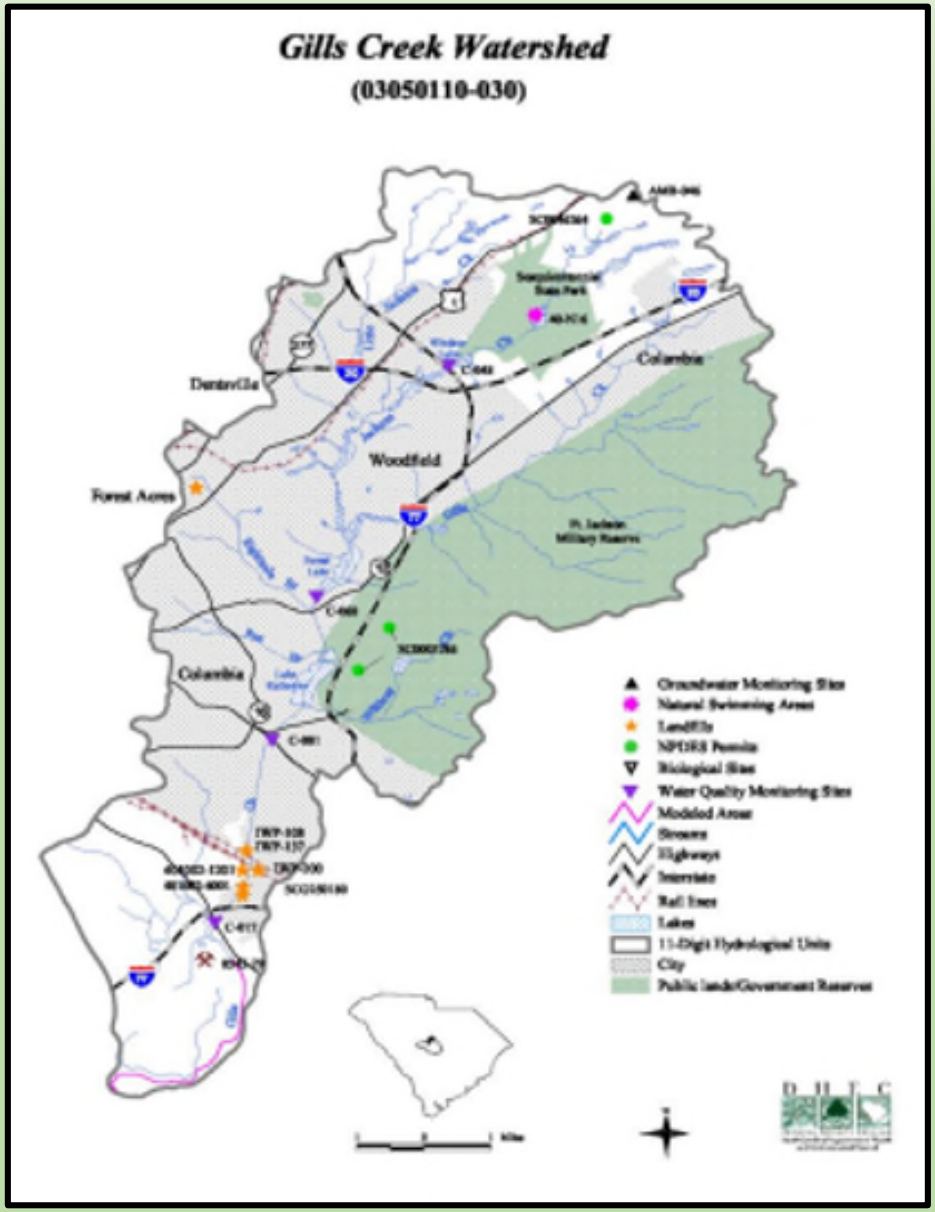
Murphy, NOAA, 2016

But impaired prior to Flood

Prior to the flood, the GCW was:

- Impaired for aquatic life, recreation, and fish consumption, and continues to be, with *E. coli*, Pb, Zn, Hg and low DO.
- Impacts attributable to urbanization:
  - Advanced streambank erosion,
  - Wetland filling
  - Impervious surfaces causing increased runoff & litter
  - Periodic flooding
  - Accumulation of sediment in lakes
  - lack of riparian or stream-side vegetation

Water Quality – Select locations



- C- 046 Sesquicentennial SP Lake
  - Impaired for fish consumption due to Mercury
- Site C- 048
  - Impaired for Aquatic Life due to DO
- Site C- 068
  - Impaired for fish consumption due to Mercury (historic)
- Site C- 001
  - Impaired for recreational uses due to fecal coliform
- Site C- 017
  - Impaired for Recreational Uses due to fecal coliform and Aquatic Life due to low DO & impaired with Pb, Zn

Reclamation Assistance with CWA §319 Grant

One 2015 severely flood impacted and impaired stream stretch along Crowson Road, between Fort Jackson Blvd and Devine St :

had been ditched,

had severely eroded stream banks,

all prior floodplain areas filled and covered with impermeable asphalt,

was partially reclaimed with §319 Grants from EPA administered through SC DHEC, and Richland County, City of Columbia and GCWA funds.

Litter pick-up 2018 along GC and Crowson Road. Continuous litter from discarding and runoff.

2020 Parking lot direct RO to Gills Creek

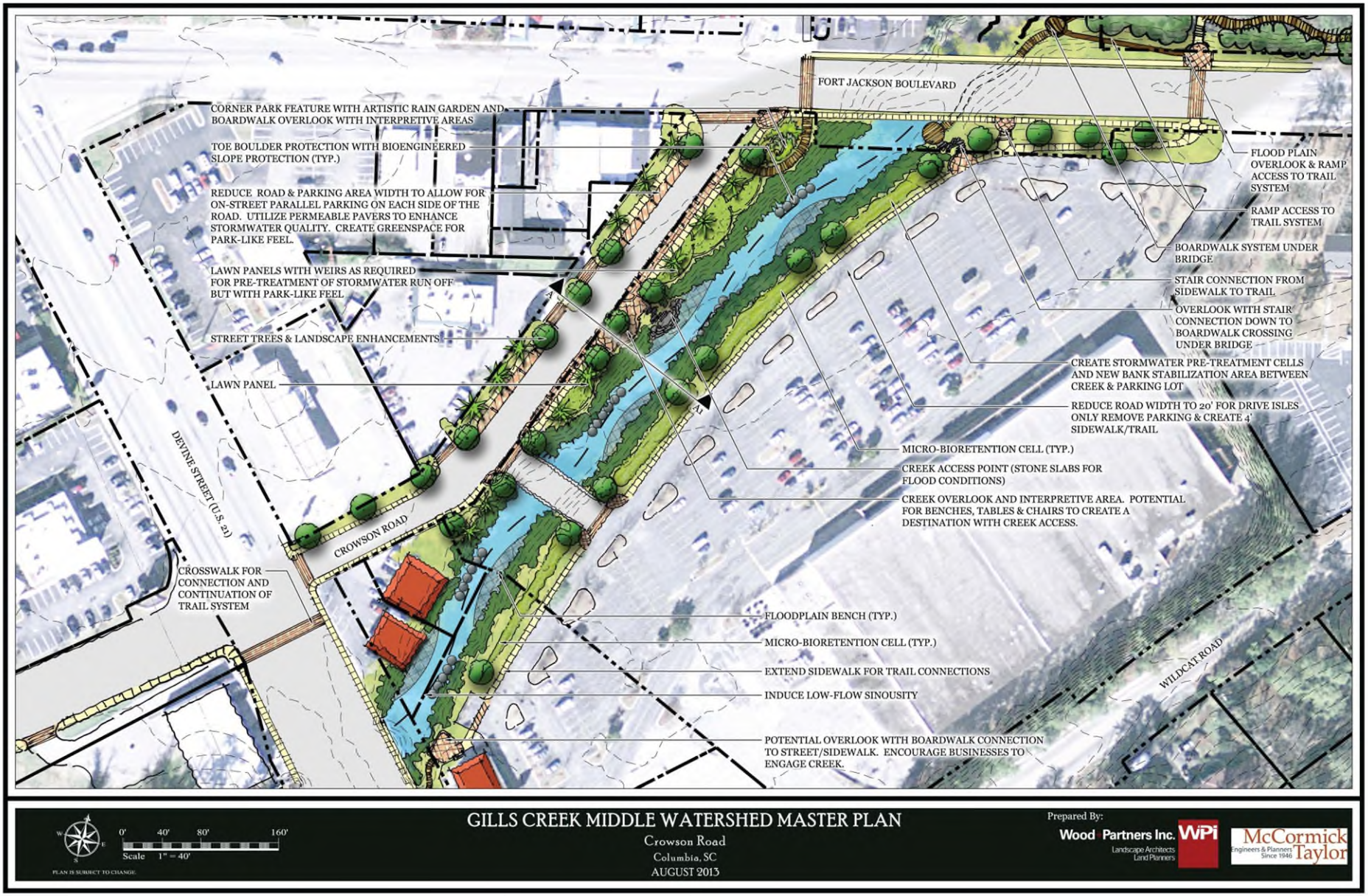
2018- Steep slopes, heavily eroded and little riparian buffer

2018-02-27

Storm water erosion along Crowson Road

2017-08-28

GCWA's
Crowson Road Enhancement Project



Reclamation and Stream Enhancement Elements:

The nearly $1 million dollar project enhanced 261 m (856 ft) of stream banks using at least 9 reclamation techniques and several water quality improvement measures including:

1) Demolition / Removal of existing detrimental elements.

2) Install two large infiltration/bio-retention basins/ bio-swales allowing infiltration to groundwater and slower release as base flow;

Pre

During Construction

Bio swales

3/28/2023 – water in bioswale from heavy rain previous day

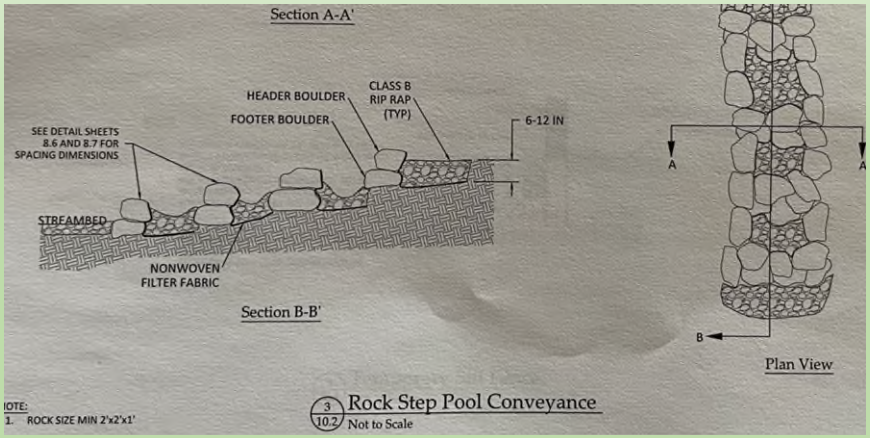
4/21/2023 – vegetation becoming established

Permanent Planting Applications			
Bioretention Planting Zone- Container Planting			
Common Name	**Scientific name**	**Stratum**	Individual Spac
Switch Grass	***Panicum virgatum***	**Herb**	3 ft
River Oats	***Chasmanthium latifolia***	**Herb**	3 ft
Indian Grass	***Sorghastrum nutans***	**Herb**	3 ft
Summersweet Clethra	***Clethra alnifolia***	**Shrub**	3-6 ft
Virginia sweetspire	***Itea virginica***	**Shrub**	3-6 ft
Arrowood Virburnum	***Vibernum dentatum***	**Shrub**	3-6 ft
Inkberry	***Ilex glabro***	**Shrub**	3-6 ft

3/28/2023 Lower Bio-Swale and
toe rocks retaining sediment from high flow event

Reclamation and Stream Enhancement Elements:

3) mini-infiltration basins thru Rock Step Pool conveyances;
   Increase DO and
   Increase infiltration



4) boulder placement along bank to reduce sediment loads from upstream;

5) boulder placement at bank toe to reduce slope pitch;

Installed boulder toe

3/28/2023

Reclamation and Stream Enhancement

Elements:

6) daylighting of stormwater pipes to rip rapped flow channels,
7) removal of asphalt stormwater discharge flumes and replacement with step boulders creating a series of small waterfalls to aerate water (increase DO)

Installed and stabilized rock cascade

8) Geolift Installation

3/28/2022

Installed geolifts 4/2022

Geolift Planting

Live stakes, plants, seeded

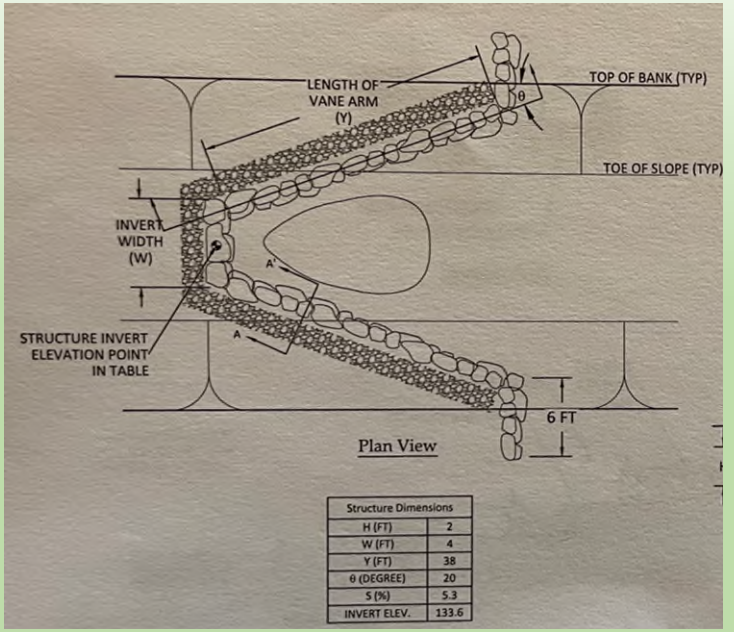
April 2023

9) Rock Cross Vane and J-Vane to be installed for bank stabilization and improved habitat

2022 – Pre-Construction; looking upstream

Rock Cross Vane installation

3/28/2022 – during construction



Bank stabilization, improved habitat

4/5/2023

Native Plants and competition…

- Native plants should replace invasive and non-native species along reclaimed stream. Monitoring is on-going but decreased erosion, increased sediment capture, and increased wildlife observed.

Permanent Planting Applications				
Streambank Planting Zone- Live Stakes & Herbaceous Plugs				
Common Name	Scientific name	Stratum	Individual Spacing	Quantity
Button Bush	*Cephalanthus accidentalis*	Shrub	3-6 ft	125
Nine Bark	*Physocarpus opulifolis*	Shrub	3-6 ft	125
Lurid Sedge	*Corex Lurida*	Herb	3 ft	125
Soft Rush	*Juncus effusus*	Herb	3 ft	125
Woolgrass	*Scirpus cyperinus*	Herb	3 ft	125

Permanent Planting Applications				
Riparian Planting Zone- Container Planting				
Common Name	Scientific name	Stratum	Individual Spacing	Quantity
Strawverry Bush	*Euonumus americanus*	Shrub	3-6 ft	13
Coastal Sweet Pepperbush	*Clethra alnifolia*	Shrub	3-6 ft	14
Beatty Berry	*Callicarpa americana*	Shrub	3-6 ft	13
Sweet-shrub/Carolina Allspice	*Calycanthus floridus*	Shrub	3-6 ft	13
Lurid Sedge	*Corex Lurida*	Herb	3 ft	36
Soft Rush	*Juncus effusus*	Herb	3 ft	36
Woolgrass	*Scirpus cyperinus*	Herb	3 ft	36

Permanent Planting Applications				
Upland Planting Zone- Ball and Burlap				
Common Name	Scientific name	Stratum	Individual Spacing	Quantity
Sycamore	*Plantantus occidentalis*	Canopy	16 ft	2
White Oak	*Quercus alba*	Canopy	16 ft	2
Shumard Oak	*Quercus schumardil*	Canopy	16 ft	2
Redbud	*Cercis canadensis*	Mid-Story	8 ft	2
Sweetbay magnolia	*Magnolia virginiana*	Mid-Story	8 ft	1
Shadbus Serviceberry	*Amelanchier canadensis*	Mid-Story	8 ft	2
Willow Oak	*Quercus phellos*	Canopy	16 ft	11

Calycanthus floridus

Native Seed Mixes

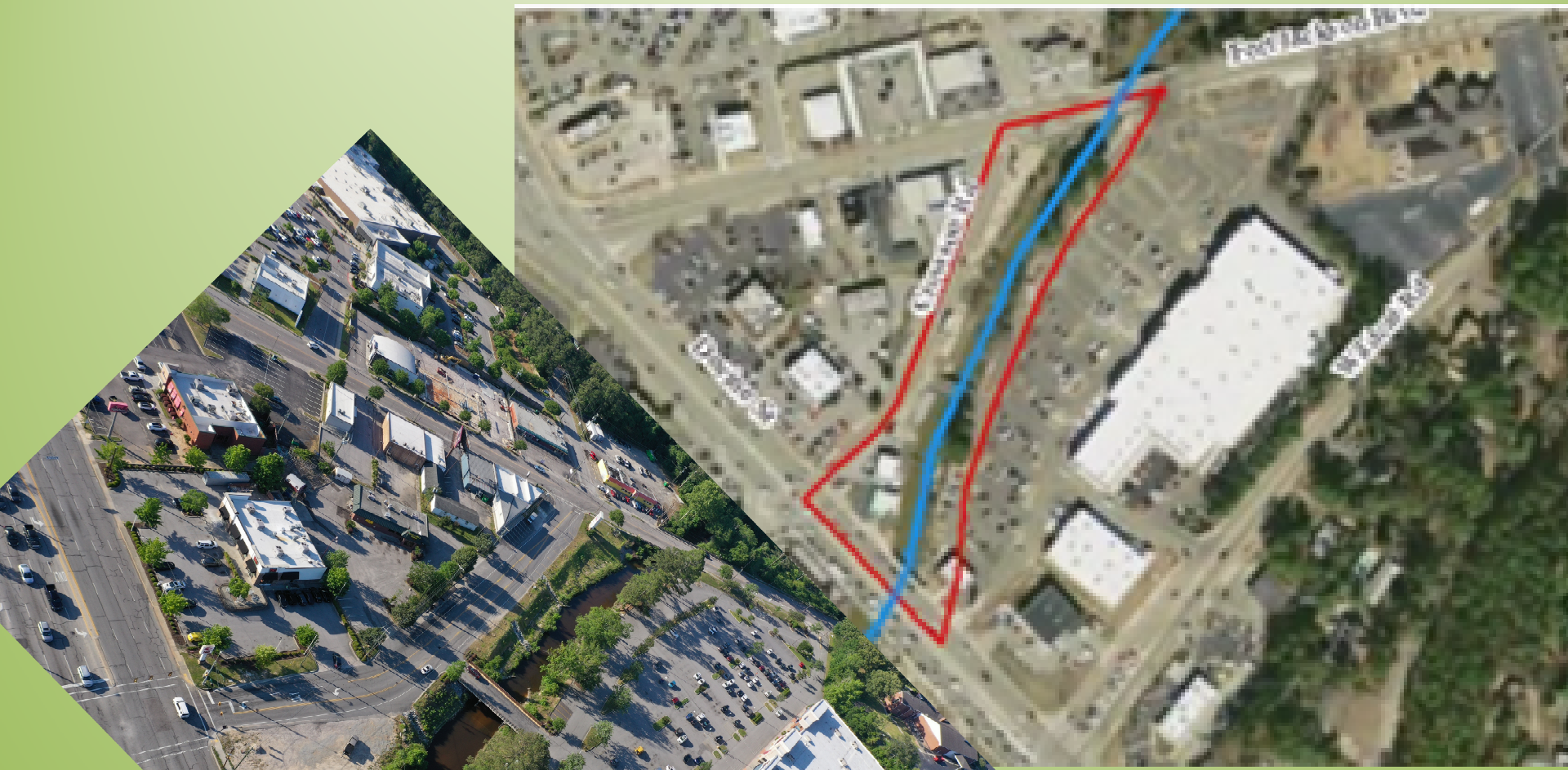
Riparian Seed Mix (Density 20 lbs/ac)		
Common Name	Scientific name	Percentage
Indian Grass	*Sorghastrum nutans*	15
Deer Tongue	*Dichanthelium clandestinum*	15
Riverbank wildrye	*Elymus Riparius*	10
Virginia wildrye	*Elymus virginicus*	10
Fox Sedge	*Carex vilpinoidea*	10
Winter Bentgrass	*Agrostis hyemalis*	5
Redtop Panicgrass	*Panicum rigidulum*	5
Switchgrass	*Panicum virgatum*	5
Prairie Coreopsis	*Coreopsis tinctoria*	5
Lancelleaf Coreopsis	*Coreopsis lanceolata*	5
Blackeyed Susan	*Redbeckia hirta*	5
Bur Marigold	*Bidens aristosa*	5
Swamp Sunflower	*Hellanthus angustifolia*	5

Upland Seed Mix (Density 20 lbs/ac)		
Non-mowed Area		
Common Name	Scientific name	Percentage
Indian Grass	*Sorghastrum nutans*	20
Virginia wildrye	*Elymus virginicus*	20
Little bluestem	*Schizachyrium scoparium*	15
Purple top	*Tridens flavus*	12
Prairie coreopsis	*Coreopsis tinctoria*	5
Lanceleaf coreopsis	*Coreopsis lanceolata*	5
Blackeyed susan	*Redbeckia hirta*	5
Bur marigold	*Bidens aristosa*	5
Maximillian sunflower	*Helianthis maximiliani*	5
Purple coneflower	*Echinocea purpurea*	5
Common milkweed	*Asclepias syiaca*	3

Crowson Road – Gills Creek Stream Reclamation Project

Completed 2023

Crowson Road GC Enhancement partners: SCDHEC/EPA, City of Columbia, Richland County, RC Conservation Commission & GCWA.



Pre- 2015 Flood

4/2023

GILLS CREEK WATERSHED ASSOCIATION

Acknowledgements

- SC Department of Health and Environmental Control, §319 Grant Program
- City of Columbia
- Richland County
- Richland County Recreation Commission
- Matt Sasser, Bright-Meyers Ft Jackson LLC
- Gills Creek Watershed Association

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Thank You

Questions?

Gwen Geidel

Geidel@sc.edu

University of South Carolina College of Arts and Sciences | School of the Earth, Ocean and Environment

GCWA