

# CITY OF ROSWELL STREAM ASSESSMENT

**2018**

Danelle Murray P.E.  
Water Resources Engineer  
City of Roswell

Austin Brown  
Scientist II  
R2T, Inc.



# CITY OF ROSWELL

- LOCATED IN THE ATLANTA METROPOLITAN AREA, NORTHERN FULTON COUNTY
- BOUNDED TO THE SOUTH BY THE CHATTAHOOCHEE RIVER
- MANY OTHER CREEKS AND STREAMS
- RECREATIONAL ACTIVITIES ARE WATER-FOCUSED
- PARKS LOCATED ALONG RIVERS AND CREEKS
- CITIZENS WHO ARE ENVIRONMENTALLY AWARE



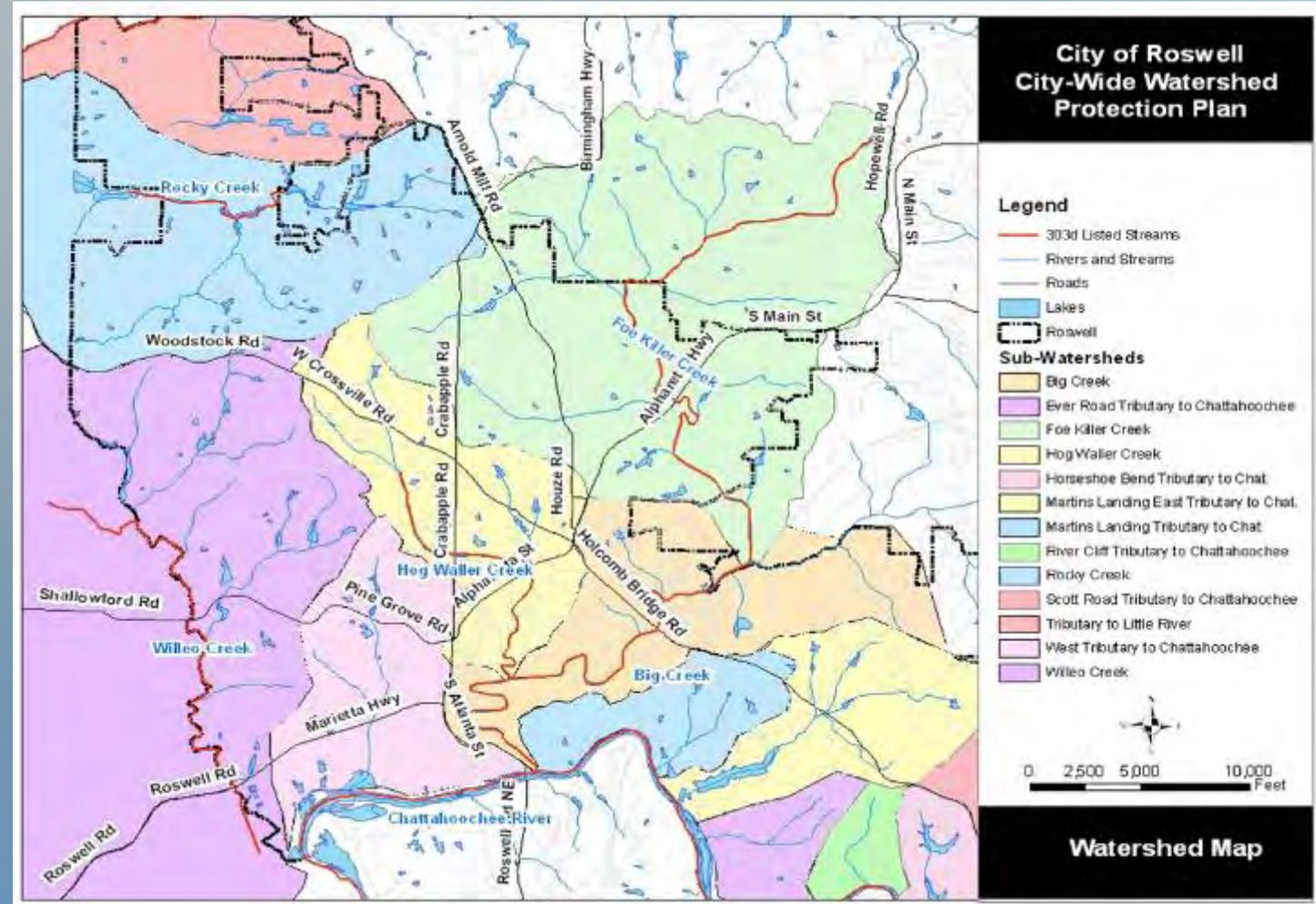
# ROSWELL'S MONITORING PROGRAM GOALS

- TO IDENTIFY POLLUTANT SOURCES
- TO MEET THE GOALS OF PROTECTING PUBLIC HEALTH AND SAFETY
- TO IMPROVE THE QUALITY OF THE ENVIRONMENT
- TO PROMOTE SUSTAINABLE SOLUTIONS
- TO RECLASSIFY THE IMPAIRED STREAMS FROM 303D LIST IN A COST-EFFECTIVE MANNER



# ROSWELL AND R2T'S HISTORY

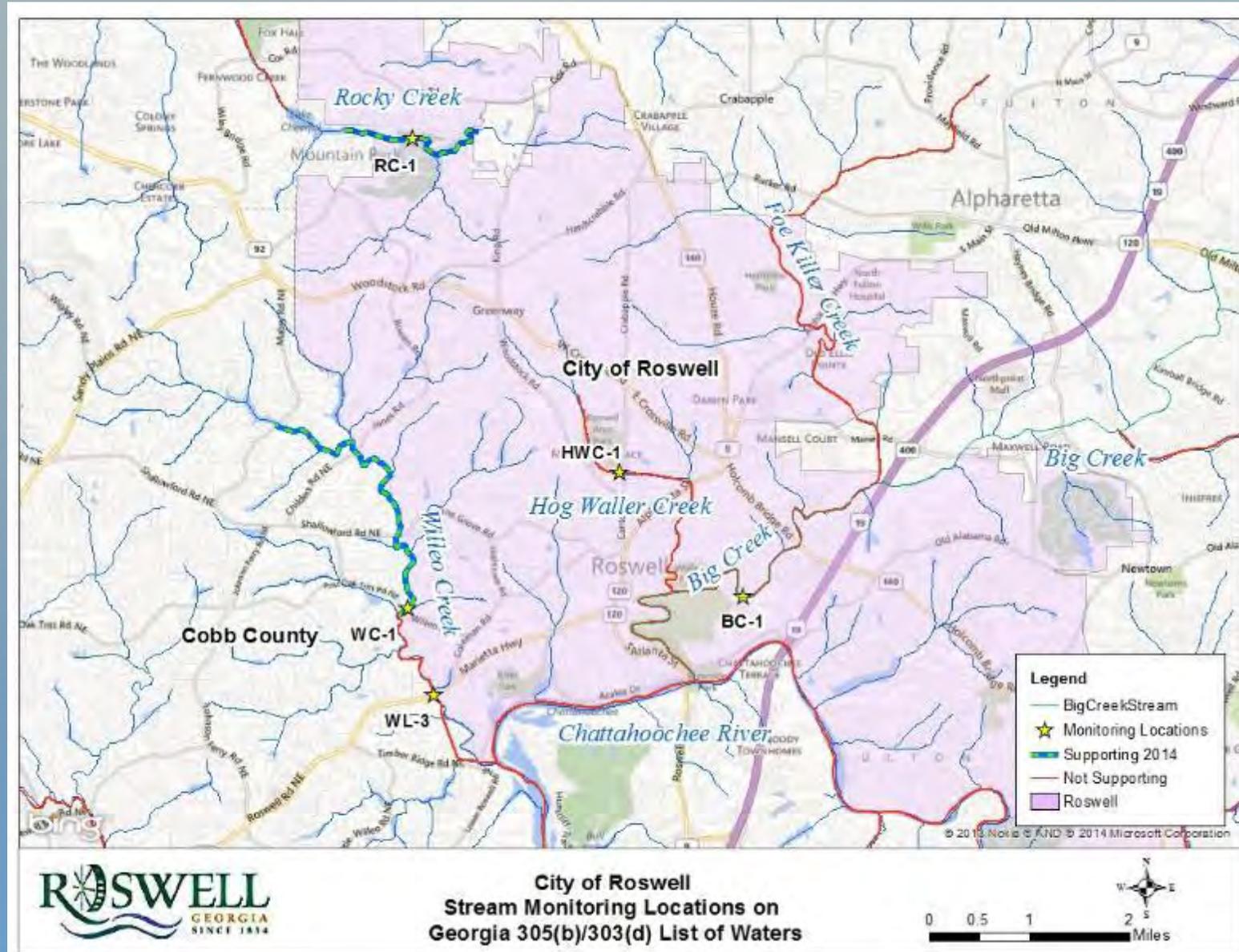
- WATERSHED PROTECTION PLAN
- BACTERIA AND SEDIMENT MONITORING
- BACTERIA SOURCE TRACKING
- STREAM ASSESSMENTS



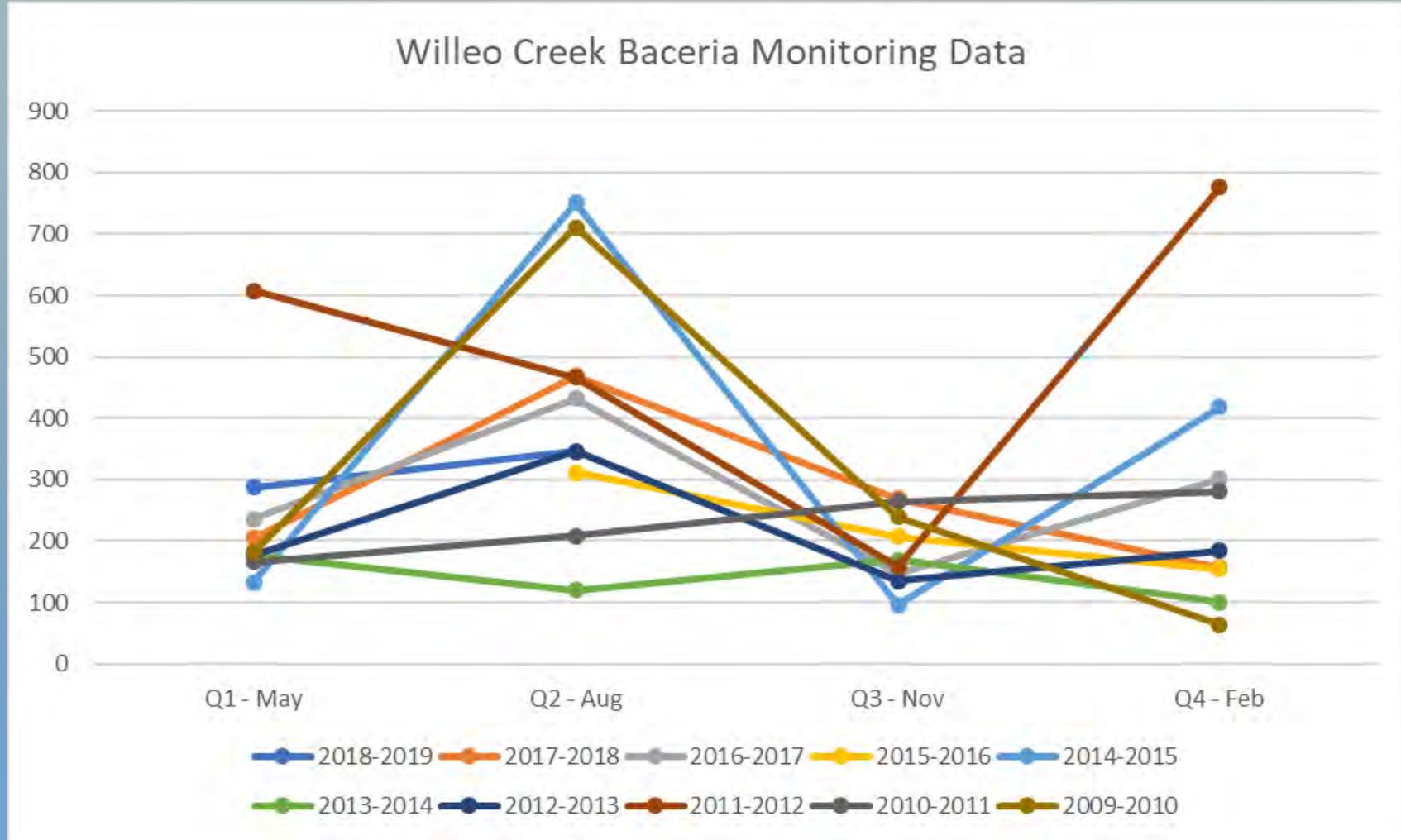
# WATER QUALITY MONITORING SUCCESS



WATER QUALITY MONITORING ALLOWED THE DELISTING OF THE UPPER SECTION OF WILLEO CREEK AND THE DELISTING OF ROCKY CREEK



# ROSWELL WATER QUALITY HISTORY



# REASON FOR STREAM ASSESSMENT

- MULTIPLE METRO ATLANTA MUNICIPALITIES HAVE DEVELOPED A STORMWATER MANAGEMENT PLAN (MS4 PERMIT REQUIREMENT)
- THE STORMWATER MANAGEMENT PLAN INCLUDES MONITORING FOR IMPAIRED STREAMS (MS4 PERMIT REQUIREMENT)
- THIS MONITORING INCLUDES BACTERIA (FECAL COLIFORM AND E. COLI) SAMPLING OF MULTIPLE IMPAIRED STREAM WITHIN THE ROSWELL CITY LIMITS
- THESE IMPAIRED STREAMS ARE LISTED ON THE 2016 GEORGIA 305(B)/303(D) REPORT LISTS OF IMPAIRED STREAMS FOR *FECAL COLIFORM* BACTERIA

# REASON FOR STREAM ASSESSMENT

- THE STREAM ASSESSMENT PROVIDES SUPPORTING DATA FOR THE IMPAIRED STREAMS MONITORING PROGRAM (IDENTIFICATION OF ILLICIT DISCHARGE)
- THE STREAM ASSESSMENT DATA CAN BE USED FOR HYDRAULIC MODELING OF STREAM SEGMENTS AND FUTURE STRUCTURAL BEST MANAGEMENT PRACTICES
- IDENTIFIES POTENTIAL MAINTENANCE ISSUES THAT CAN LEAD TO ILLICIT DISCHARGE
- STREAM ASSESSMENTS PROVIDE A FIRSHAND ACCOUNT OF THE CONDITION OF THE STREAMS AND THE SURROUNDING AREA.

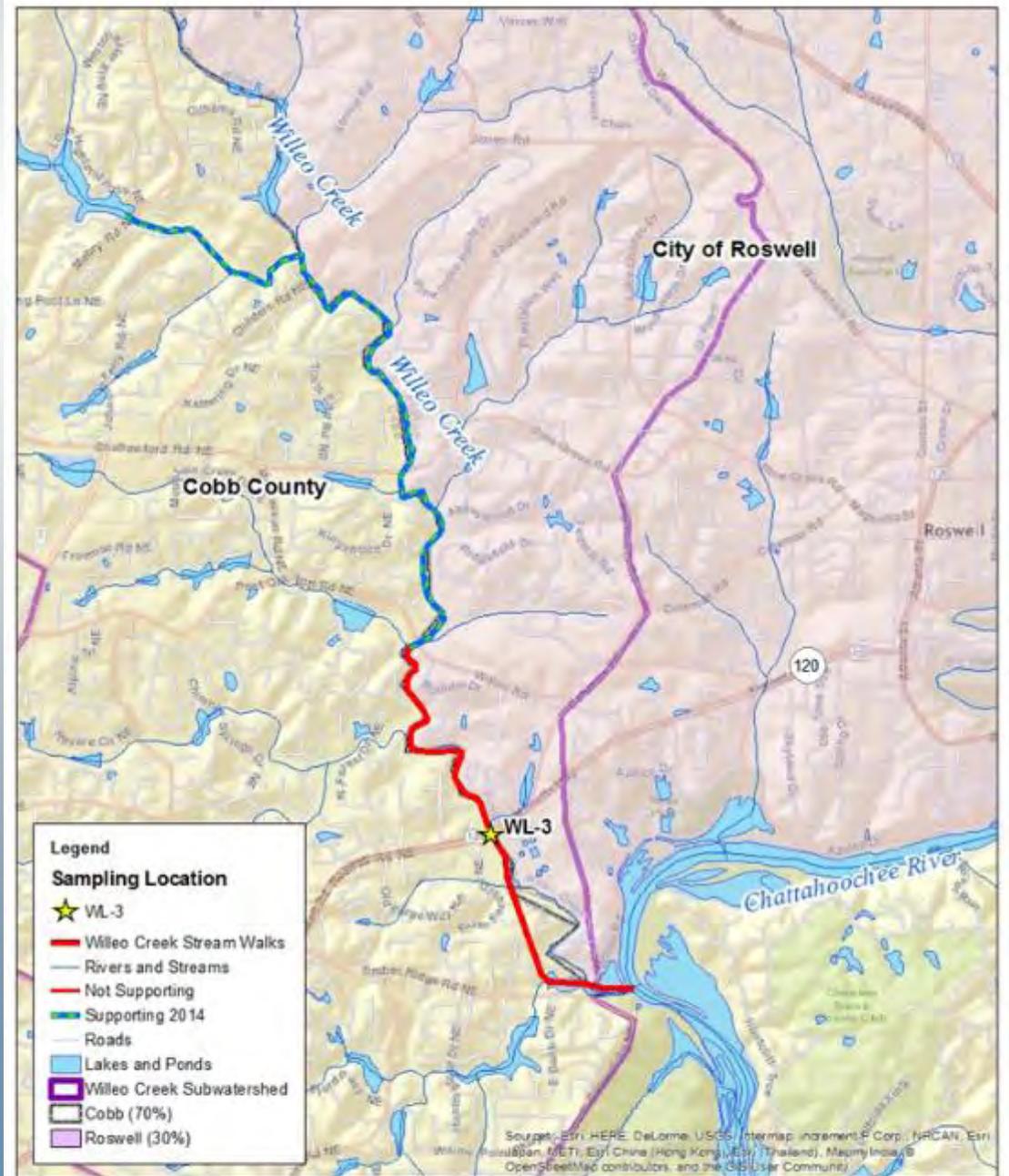


# IMPAIRED STREAMS INVESTIGATED IN THE METRO ATLANTA WATERSHED

Stream	Watershed	Violation	Potential Cause	Stream Length
<b>Willeo Creek</b>	Headwaters to Chattahoochee River	FC	UR	2 Miles
<b>Nancy Creek</b>	Headwaters to Peachtree Creek	FC, Bio F	UR	16 Miles
<b>Long Island Creek</b>	Headwaters to Chattahoochee River	FC, Bio F	UR	5 Miles
<b>Ball Mill Creek</b>	Headwaters to Chattahoochee River	FC	UR	3 Miles
<b>Crooked Creek</b>	Headwaters to Chattahoochee River	FC, Bio F	UR	2 Miles
<b>Marsh Creek</b>	Headwaters to Chattahoochee River	FC, Bio F	UR	4 Miles
<b>Morning Creek</b>	Headwaters to Flint River	FC	UR, NP	31 Miles
<b>Utoy Creek</b>	Headwaters to Chattahoochee River	FC, Zn	UR	13 Miles

FC – Fecal Coliform, Bio F – Fish Biota, Zn – Zinc, UR - Urban Runoff, NP - Nonpoint Sources/Unknown Sources

# STREAM WALK OVERVIEW



City of Roswell  
Willeo Creek  
Streamwalk Location Map



# STREAM WALK OVERVIEW

- SCIENTISTS AND ENGINEERS COLLECTED FIELD DATA BY WALKING, MEASURING, AND PHOTOGRAPHING CRITICAL AREAS IN THE WATERSHED (I.E. STREAMS, WETLANDS, CONVEYANCE SYSTEMS, AND POTENTIAL POLLUTANT SOURCES).



# DATA COLLECTED

## STREAM POINT ID (SPID)

COLLECTED EVERY 500 TO 1000 FEET TO DOCUMENT STREAM CONDITIONS.



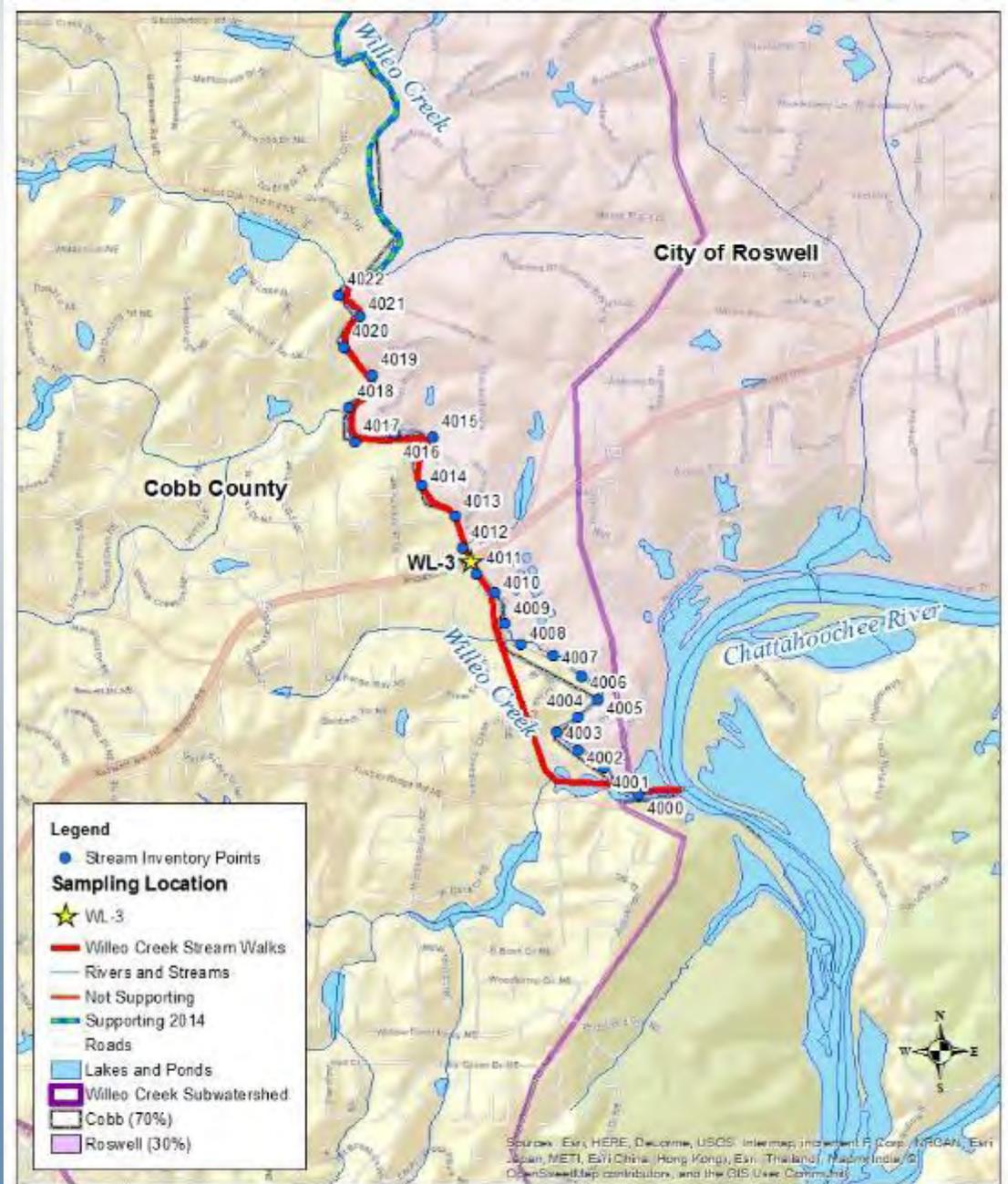
## REPRESENTATIVE REACH POINTS (RRP)

ONCE APPROXIMATELY EVERY MILE OR SIGNIFICANT HABITAT CONDITION CHANGE. FILL OUT APPROPRIATE HABITAT ASSESSMENT FORM (LOW/HIGH) GRADIENT.

## MAINTENANCE POINTS (MP)

MAINTENANCE POINTS ARE COLLECTED ON STORM SEWER AND SANITARY SEWER INFRASTRUCTURE AND STREAM BANK CONDITIONS TO IDENTIFY POTENTIAL AREAS FOR MAINTENANCE BY PRIVATE PROPERTY OWNER, CITY, OR COUNTY.

# STREAM INVENTORY DATA POINTS



# CHANNEL EVOLUTION MODEL (CEM) STAGE

Stage	Description
1	Stable/Undisturbed
2	Initial Disturbance
3	Incision
4	Incision and Widening
5	Aggradation
6	Equilibrium



# POLLUTION SOURCES

## POINT SOURCE

- SEWER LINE/SSO
- CHEMICAL DISCHARGE
- ILLICIT STORM WATER DISCHARGE

## NON-POINT SOURCE

- LIVESTOCK
- AGRICULTURAL RUNOFF
- PRIVATE PET WASTE IN RESIDENTIAL AREAS



# CHANNEL ALTERATIONS

- CHANNELIZED REACH
- PIPED REACH
- RIP-RAP CHANNEL
- GABION BASKETS
- FLOODPLAIN BUILT UP
- CONCRETE CHANNEL



# STREAMBANK EROSION

- PERCENT EROSION
- LENGTH OF EROSION
- AVERAGE BANK HEIGHT



# STREAM BUFFER ENCROACHMENTS

- ALTERED VEGETATION
- IMPERVIOUS COVER
- LANDSCAPING
- STRUCTURES
- UTILITIES



# COMMENTS

- INVASIVE SPECIES
- RAIL ROAD/ROAD/PRIVATE DRIVE CROSSINGS
- TRIBUTARY CONFLUENCES
- SEWER LINE CROSSINGS
- STORM WATER OUTFALLS
- BMPS



# WILLEO CREEK STREAM POINT 4012

UPSTREAM



DOWNSTREAM



Eroded streambanks along main stem of Willeo Creek North of Roswell rd

# WILLEO CREEK STREAM POINT 4012

LEFT BANK



RIGHT BANK



Eroded streambanks along main stem of Willeo Creek North of Roswell rd

# WILLEO CREEK STREAM POINT 4012

BONUS PHOTO ROSWELL RD

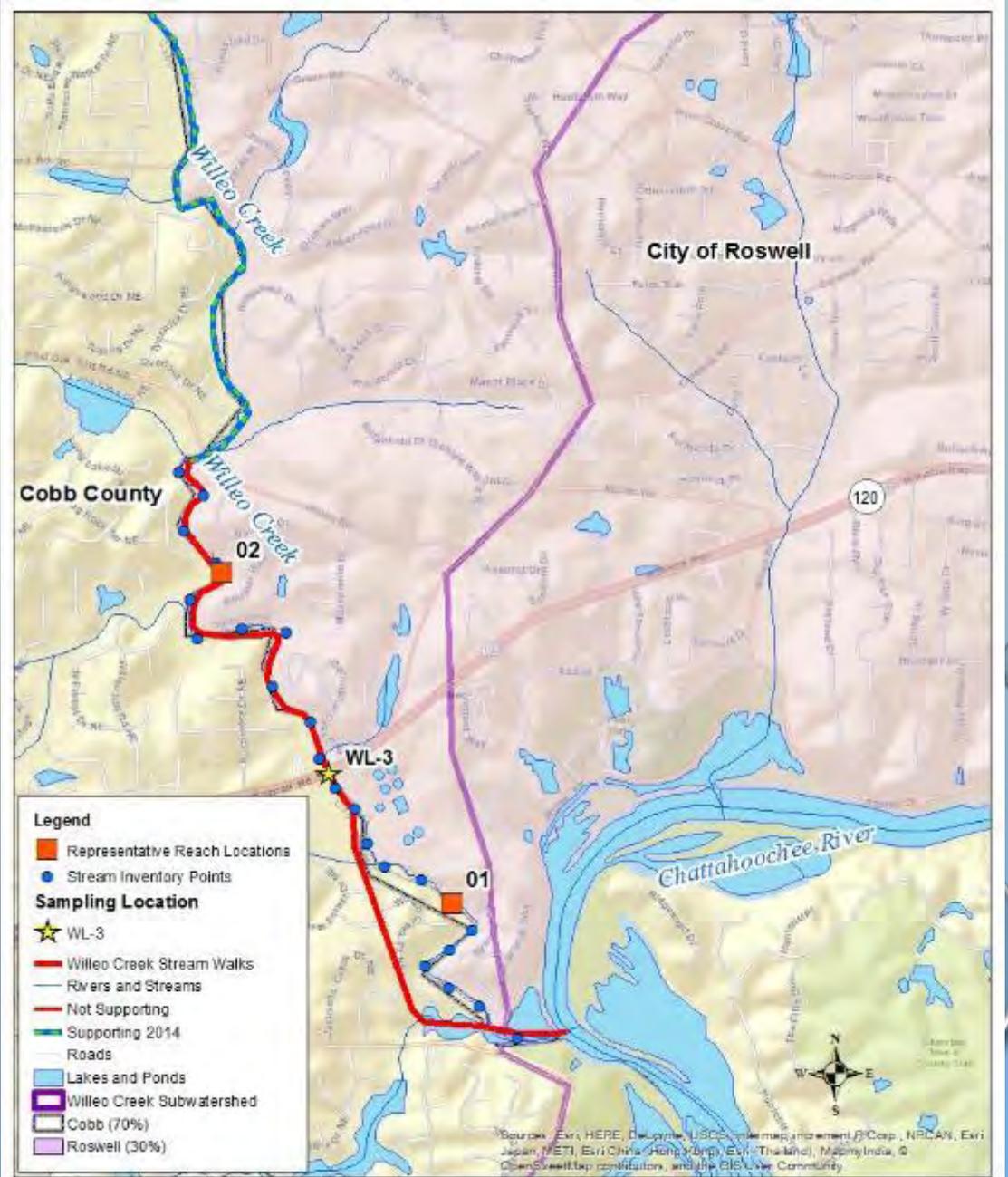


Willeo Creek Roswell, GA

BONUS PHOTO SMALL TRIB



# REPRESENTATIVE REACH POINTS



City of Roswell 0 0.25 0.5 1 Miles  
Willetto Creek  
Representative Reach Locations

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME	LOCATION	
STATION #	REACH ID#	STREAM CLASS
UTM N	UTM E	RIVER BASIN
STORE #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE TIME	REASON FOR SURVEY

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Invertebrate Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of emergent, submerged, logs, undercut banks, cobble or other stable habitat and all stages to allow full colonization potential (e.g., logjams that are not now full and not transient).	20-50% mix of stable habitat; well suited, but full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new OB, but not yet prepared for colonization (may rate as high end of scale).	10-50% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of various materials, with gravel and fine sand prevalent; some mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; sand may be dominant; some mats and submerged vegetation present.	All mud or clay or sand banks; little or no rock; mats and submerged vegetation.	Hard pan clay or bedrock; no mats, rock or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Presence of large-shallow, large-deep, and small-shallow, small-deep pools present.	Majority of pools large-deep, very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pool absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new material in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 40-80% of the bottom affected; sediment deposits; obstructions, constrictions, and banks; moderate deposition of pools prevalent.	Heavy deposits of fine material; increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to sediment; sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel; smaller side channels are frequently exposed.	Very little water in channel and mostly present in standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; areas with natural pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging (greater than past 30 yr) may be present, but overall channelization is not present.	Channelization may be extensive; embankment or sloping structures present on both banks; and 40 to 60% of stream reach channelized and disrupted.	Banka direct with gabions or concrete; over 90% of the stream reach channelized and disrupted; in-stream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Straightness	The beds in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note: channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily used in these areas.)	The beds in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The beds in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; watering has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	Bank stable; evidence of erosion or bank failure absent or minimal; little potential for future problems; <5% of bank affected.	Moderately stable; infrequent, small areas of erosion newly healed over; 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many product trees; "owl" nests frequent along straight reaches and head; obvious bank sloughing; 60-100% of bank has eroded scars.
SCORE (L/R)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (R/L)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surface and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or sedgebeds. (Note: dominance tall or right side by trees downstream.)	70-90% of the streambank surface covered by native vegetation, but one class of plants is not well represented; disturbance evident but not affecting full plant growth potential in any given section; more than one-half of the potential plant stature height remaining.	50-70% of the streambank surface covered by vegetation; disruption evident; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stature height remaining.	Less than 50% of the streambank surface covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 4 centimeters or less in average stubble height.
SCORE (L/R)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (R/L)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (L/R)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (R/L)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Parameters to be evaluated broader than sampling reach

Total Score \_\_\_\_\_

# VISUALLY BASED HABITAT CHARACTERISTICS FOR WILLEO CREEK

City of Roswell Environmental/Public Works

## Willeo Creek Stream Walks

Habitat Parameters	ID (1)	ID (2)
1- Epifaunal Substrate/Available Cover	3	6
2- Pool Substrate Characterization	7	8
3- Pool Variability	10	12
4- Sediment Deposition	9	7
5- Channel Flow Status	7	6
6- Channel Alteration	11	12
7- Channel Sinuosity	7	8
8- Bank Stability Left Bank	7	3
8- Bank Stability Right Bank	8	3
9- Vegetative Protection Left Bank	2	2
9- Vegetative Protection Right Bank	2	2
10- Riparian Vegetative Zone Width LB	3	2
10- Riparian Vegetative Zone Width RB	3	3
Total Score:	79	74
Condition Categories	Marginal	Marginal

# REPRESENTATIVE REACH POINT 2 UPSTREAM

Habitat Parameters	ID (2)
1- Epifaunal Substrate/Available Cover	6
2- Pool Substrate Characterization	8
3- Pool Variability	12
4- Sediment Deposition	7
5- Channel Flow Status	6
6- Channel Alteration	12
7- Channel Sinuosity	8
Total Score:	74
Condition Categories	Marginal



# REPRESENTATIVE REACH POINT 2 DOWNSTREAM

Habitat Parameters	ID (2)
1- Epifaunal Substrate/Available Cover	6
2- Pool Substrate Characterization	8
3- Pool Variability	12
4- Sediment Deposition	7
5- Channel Flow Status	6
6- Channel Alteration	12
7- Channel Sinuosity	8
Total Score:	74
Condition Categories	Marginal



# REPRESENTATIVE REACH POINT 2 LEFT BANK

Habitat Parameters	ID (2)
8- Bank Stability Left Bank	3
8- Bank Stability Right Bank	3
9- Vegetative Protection Left Bank	2
9- Vegetative Protection Right Bank	2
10- Riparian Vegetative Zone Width LB	2
10- Riparian Vegetative Zone Width RB	3
Total Score:	74
Condition Categories	Marginal

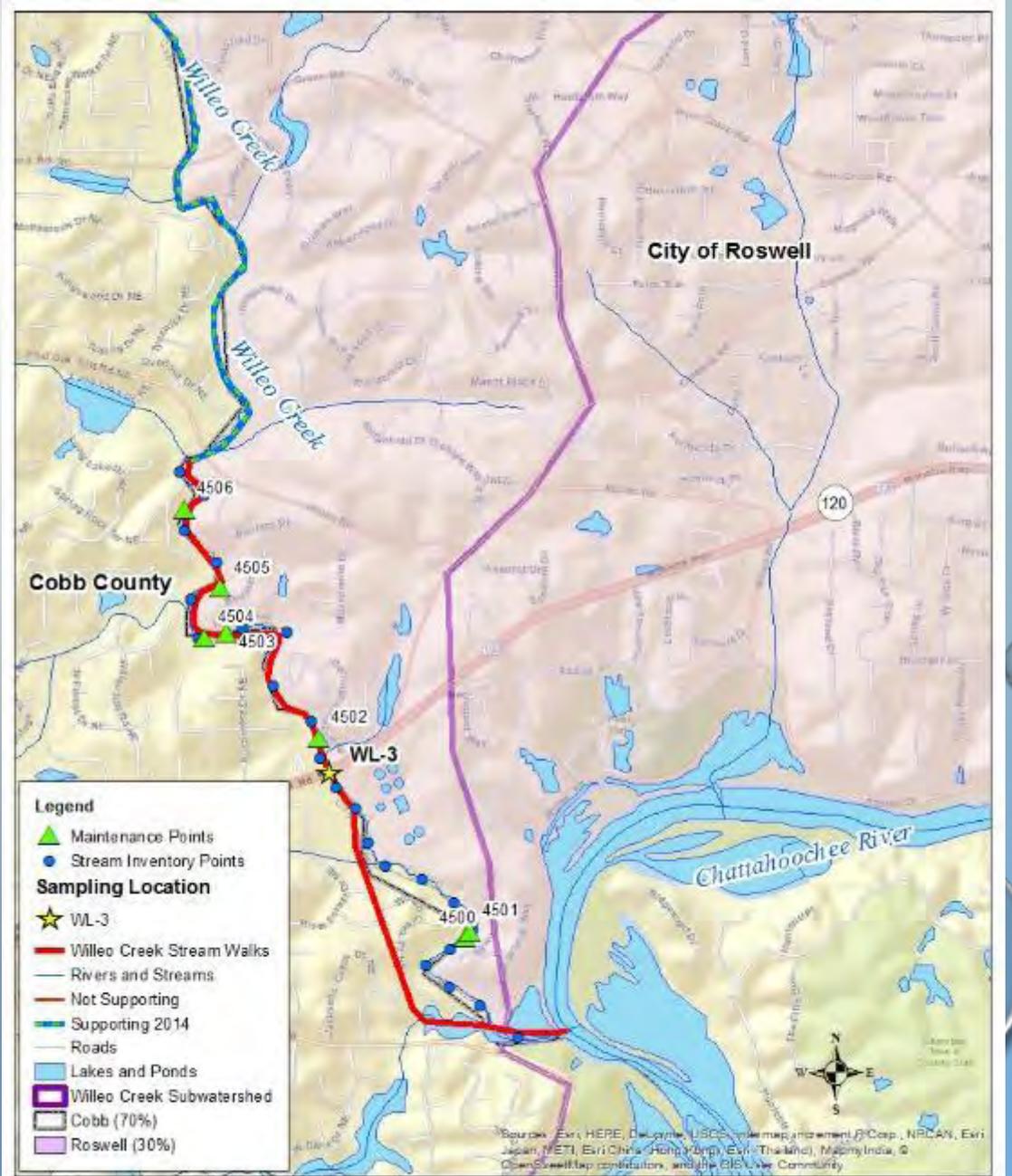


# REPRESENTATIVE REACH POINT 2 RIGHT BANK

Habitat Parameters	ID (2)
8- Bank Stability Left Bank	3
8- Bank Stability Right Bank	3
9- Vegetative Protection Left Bank	2
9- Vegetative Protection Right Bank	2
10- Riparian Vegetative Zone Width LB	2
10- Riparian Vegetative Zone Width RB	3
Total Score:	74
Condition Categories	Marginal



# MAINTENANCE POINTS



City of Roswell 0 0.25 0.5 1 Miles  
Willeo Creek  
Potential Maintenance Locations

# WILLET CREEK MAINTENANCE

<b>ID CM Point</b>	<b>Date Observed</b>	<b>Maintenance Description</b>	<b>Photo Reference</b>	<b>Priority</b>
4500	12/8/2016	Fallen tree causing debris dam	2303-2304	Low
4501	12/8/2016	Potential illicit withdraw	2305-2308	Low
4502	12/8/2016	Fallen tree, due to erosion, causing debris dam	2349-2351	Low
4503	12/8/2016	Potential illicit withdraw	2369-2371	Low
4504	12/8/2016	Fallen tree, due to erosion, causing debris dam	2372-2373	Medium
4505	12/8/2016	Potential illicit withdraw	2386-2389	Low
4506	12/8/2016	Potential illicit withdraw	2406-2408	Low

# WILLOO CREEK MAINTENANCE POINT 4504

## MEDIUM PRIORITY DEBRIS DAM



## OTHER POTENTIAL MAINTENANCE ISSUES



# MAINTENANCE POINT 1002

PIPE SAG, POTENTIAL FUTURE SANITARY  
SEWER SPILL



# MAINTENANCE POINT 1066



Eroded Infrastructure Support under private driveway

# MAINTENANCE POINT 1018



Erosion leading to emanate failure of sanitary sewer line

# MAINTENANCE POINT 1077

SEPARATED STORM DRAIN HEADWALL



# MAINTENANCE POINT 1046



Eroded stream banks – Crooked Creek at the confluence with Chattahoochee River

# MAINTENANCE POINT 1046



Eroded stream banks – Crooked Creek at the confluence with Chattahoochee River

# BENEFIT OF STREAM ASSESSMENTS

- IDENTIFY POTENTIAL ILLICIT DISCHARGE
- IDENTIFY POTENTIAL MAINTENANCE OF INFRASTRUCTURE OWNED BY CITY OF ROSWELL AND OTHERS
- PREVENT FUTURE ILLICIT DISCHARGE BY IDENTIFYING INFRASTRUCTURE APPROACHING CRITICAL FAILURE
- DOCUMENT STREAM CONDITIONS
- IDENTIFY AREAS FOR FUTURE STRUCTURAL BEST MANAGEMENT PRACTICES (BMPS)

# NEXT STEPS

- COORDINATE FINDINGS WITH LOCAL UTILITIES AND PRIVATE PROPERTY OWNERS.
- MODEL STREAM HYDROLOGY/HYDRAULICS FOR RESTORATION BMPS
- DEVELOP POTENTIAL NON-STRUCTURAL AND STRUCTURAL BMPS FOR IMPLEMENTATION.
- COMPARE COST VS BENEFIT QUALITIES TO EACH MAINTENANCE ISSUE TO DECIDE WHERE YOUR MUNICIPALITY CAN MAKE THE BIGGEST IMPACT IN YOUR WATERSHED

# FUTURE OF STREAM WALKS

3D MODELING AND PHOTOGRAMMETRY  
WITH DRONES



# FUTURE OF STREAM WALKS



PHOTOGRAMMETRY



DATA POINT CLOUDS

# QUESTIONS?

CARP RESCUE



SNAPPING TURTLE

