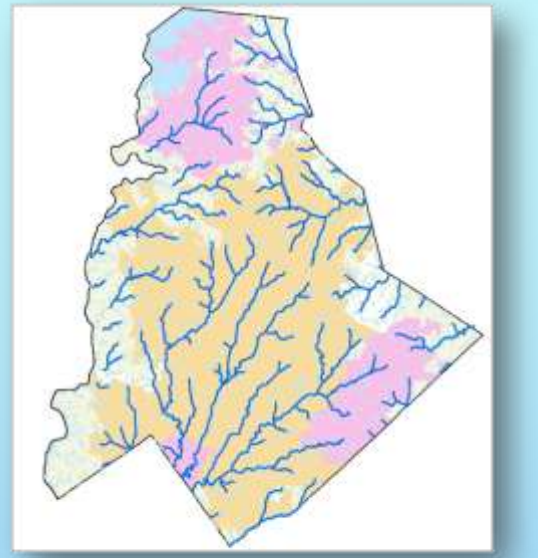
Goal Driven Water Quality Capital Improvement Program

Stream Restoration Ranking System (SRRS)

Presented by Josh DeMaury, Crystal Goode, and Olivia Edwards



Who we are?

- **<u>Mecklenburg County Storm Water Services (MCSWS) (Charlotte, NC)</u>**
  - Storm water fee-based program.
  - Consist of four (4) groups: Engineering and Flood Mitigation, Water Quality, Permitting/Compliance, and Operations.

WHY? Statement: We are passionate about making our environment safe and healthy by reducing flood losses and improving water quality for all.

Stormy – Storm Water Services mascot

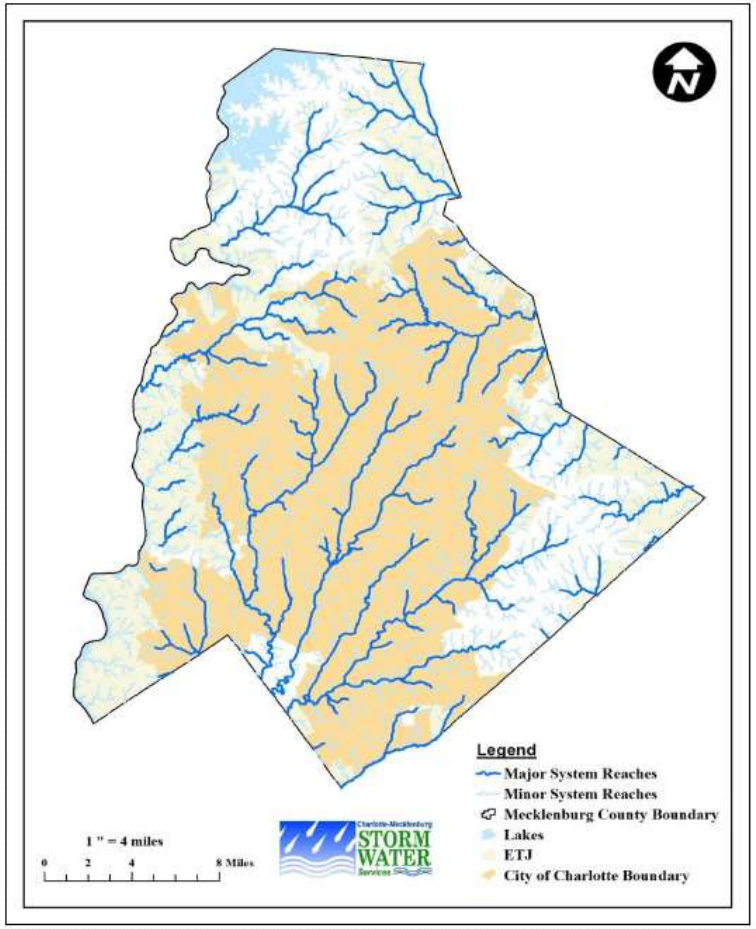
<u>Land Use and Environmental Services Agency (LUESA) Strategic Business Plan</u>

- <u>Goal</u>: **Enhance Quality of Life through Environmental Stewardship**
  - <u>Objectives</u>: Reduce flood losses and improve water quality.

Water Quality Capital Improvement Program (WQ CIP)

- To support these objectives, MCSWS restores major system (i.e., FEMA regulated) streams.
  - Approx. 361 miles of major system streams within City and County boundaries.
  - Previously WQ CIP selection process was primarily based on constructability (i.e., public property, land availability).

How can we better prioritize WQ CIP?

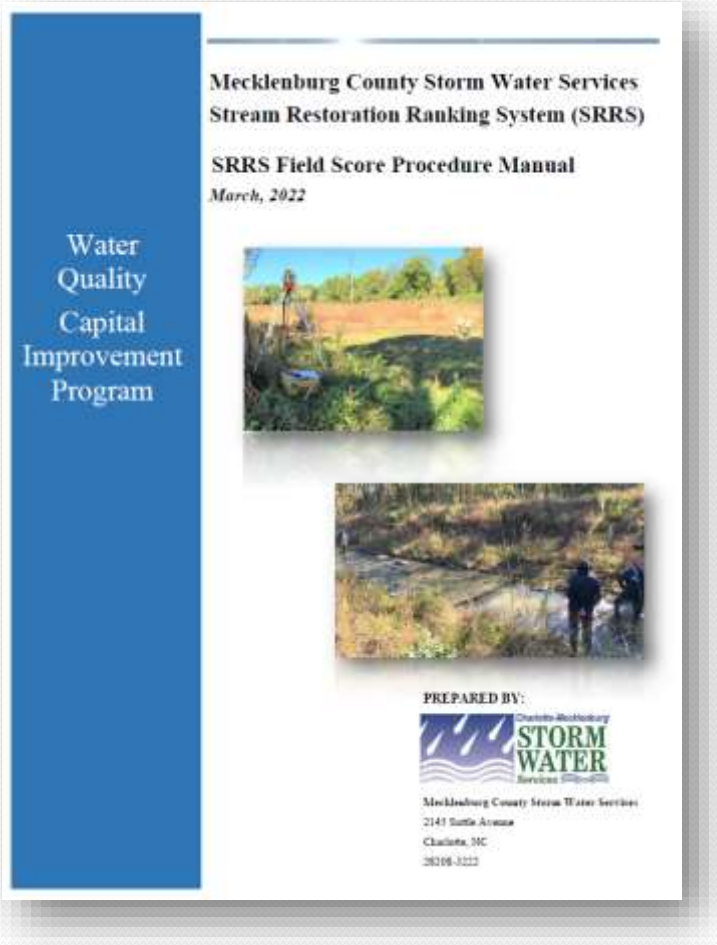


Water Quality Capital Improvement Program (WQ CIP)

Stream Restoration Ranking System (SRRS)

"To stabilize stream channels and restore habitat conditions so that as water quality improves the stream will be able to support a diverse aquatic community, including benthic macroinvertebrates and fish"

- SRRS is a data-driven process that prioritizes stream reaches with the poorest channel stability and instream habitat.
  - **SRRS PLANNING**
    - SRRS Desktop Score
  - **SRRS SEGMENT SELECTION/ EVALUATION**
    - SRRS Field Score (blended scoring system)
  - **SRRS DESIGN/CONSTRUCTION**
    - Channel Stability and Habitat Modifications
  - **SRRS SUCCESS -- LONG TERM STEWARDSHIP**
    - Project Monitoring, Inspection, and Maintenance



SRRS PLANNING

- **Where do we start? -- SRRS Desktop Score**
- GIS based system that ranks major system reaches based on **channel stability** (FEMA cross-section dimension values), **habitat** (closest annual habitat assessment monitoring location [28 sites], and **buffer** (tree canopy dataset).
- Puts us in the "ballpark".
- Updated each year.

EMHAP (Habitat) = 200 points		Channel Stability = 100 points	
Parameter	**Score**	**Parameter**	**Score**
Instream Cover	20	Bank Height Ratio	30
Epifaunal Substrate	20	Entrenchment Ratio	30
Embeddedness	20	Width to Depth Ratio State	30
Channel/Bank Alteration	20	Buffer Vegetation	10
Sediment Deposition	20		
Frequency of Riffles	20		
Channel Flow Status	20		
Bank Vegetative Protection	20		
Bank Stability	20		
Vegetation Buffer Zone Width	20		
Totals	**200**		**100**
TOTAL SRRS DESKTOP SCORE	**300**		

Mecklenburg County Tree Canopy Coverage LIDAR dataset

SRRS Segment **Selection**/Evaluation

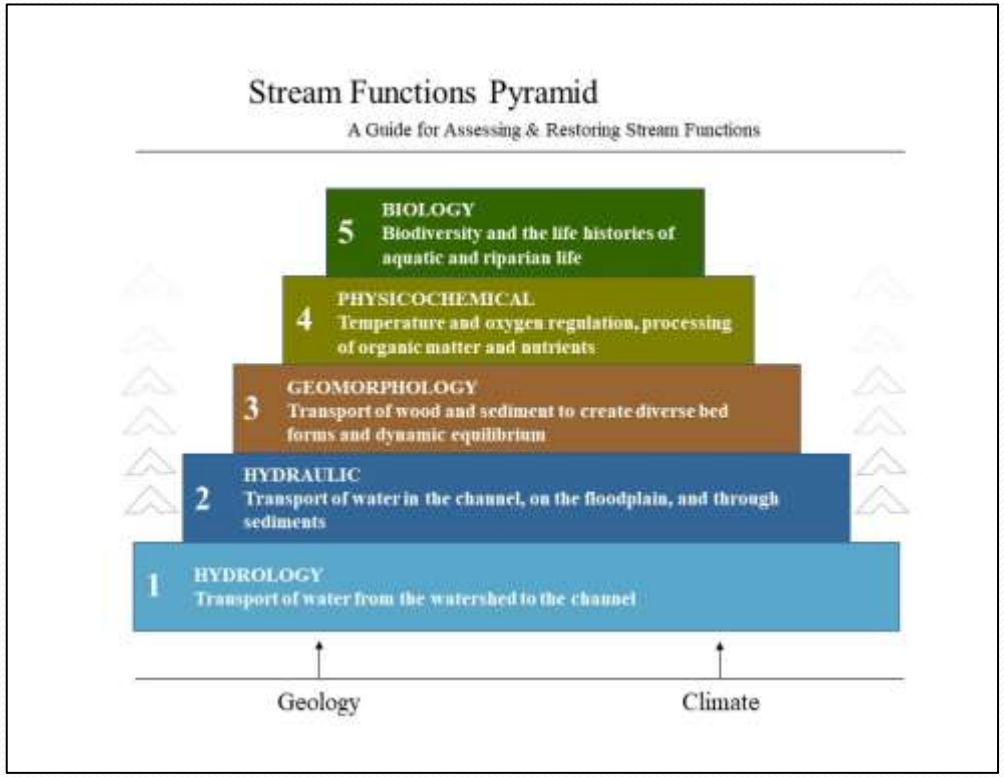
- **Where we "need" to improve first?**
  - Using Desktop Score, group segments based on stream condition ratings.
  - **Group B** (less than 190) recommended for restoration (Partially stable, not supporting) .
    - Updated yearly, can be dynamic.

SRRS Group	Group Description	# Reaches	# Miles	% Miles
Group A	Stream reaches with SRRS Score at ≥190	55	60.1	17%
Group B	**SRRS Target – Stream reaches recommended for restoration**	**155**	**205.5**	**57%**
Group C	SRRS Residual – Stream reaches not recommended for restoration	106	95.3	26%
TOTALS		**316**	**360.9**	**100%**

SRRS Score	Stream Condition Rating
<150	Unstable, not supporting
150-189	Partially Stable, not supporting
190-229	**Stable, partially supporting**
230-260	Stable, supporting
>260	Stable, fully supporting

SRRS Segment **Selection/Evaluation**

- **How do we select for field evaluation?**
  - Use SRRS Desktop Score ranking/scores (e.g., Group B).
  - Other planning efforts (i.e., partnership and grant funding).
- **How do we evaluate?**
  - **SRRS Field Score** – Blended scoring approach. Follows Will Harmon's Functional Pyramid.
    - SRRS Field Score is the only score used for future project success evaluation.
    - Desktop score is no longer used in this process.



Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. (2012). *A Function-Based Framework for Stream Assessment and Restoration Projects*. Washington, DC: US Environmental Protection Agency Office of Wetlands, Oceans, and Watersheds EPA 843 -K-12- 0 06.

SRRS Segment Selection/**Evaluation**

SRRS Field Score

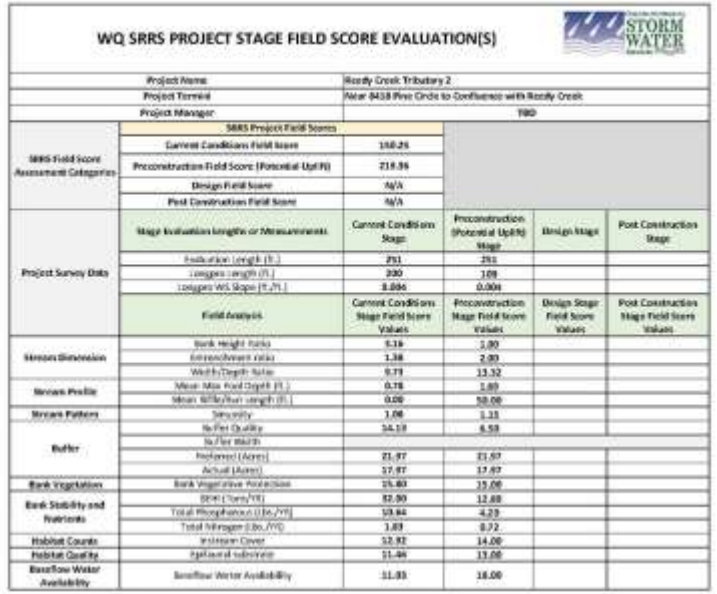
- Took most important metrics for channel stability and habitat to create 300-point scale (like desktop).
- Uses parameters from Enhanced Mecklenburg County Habitat Assessment Protocol (EMHAP).

Field Score	SRRS Field Score Assessment Categories	Analysis	Functional Pyramid
N/A	N/A	MCSWS implements programmatic goals and ordinances (e.g., (S.W.I.M. Buffers, coal tar sealants) to help promote Hydrologic uplift.	**Hydrology (Level 1)**
40	**Stream Dimension**	**Bank Height Ratio**	**Hydraulic (Level 2)**
		Entrenchment Ratio	
		Width/Depth Ratio State	**Geomorphology (Level 3)**
40	**Stream Profile**	**Percent Riffle-Run**	**Geomorphology (Level 3)**
		Mean Max Pool Depth	
20	**Pattern**	**Sinuosity**	**Geomorphology (Level 3)**
20	**Buffer**	**Buffer Quality**	**Geomorphology (Level 3)**
		Buffer Quantity	
40	**Bank Vegetative Protection**	**Vegetative Bank Assessment (EMHAP)**	**Geomorphology (Level 3)**
40	**Bank Erosion & Nutrient Load Reduction**	**Current Bank Stability (BEHI) and Nutrient Concentrations**	**Geomorphology (Level 3)**
			Physiochemical (Level 4)
40	**Habitat Counts**	**Instream Cover**	**Biology (Level 5)**
40	**Habitat Quality**	**Epifaunal substrate**	**Biology (Level 5)**
20	**Baseflow Water Availability**	**EMHAP cross-sections**	**Biology (Level 5)**

SRRS Segment **Selection**/Evaluation

Project Selection

- **SRRS Current Conditions Field Score** considered.
- WQ also determines a potential uplift score (e.g., SRRS Planning Field Score). Use SRRS long-term monitoring data to "predict".
- Other opportunities (i.e., partnerships and grant funding).
- After project is selected goes to Engineering and Mitigation (i.e., Crystal's Group).

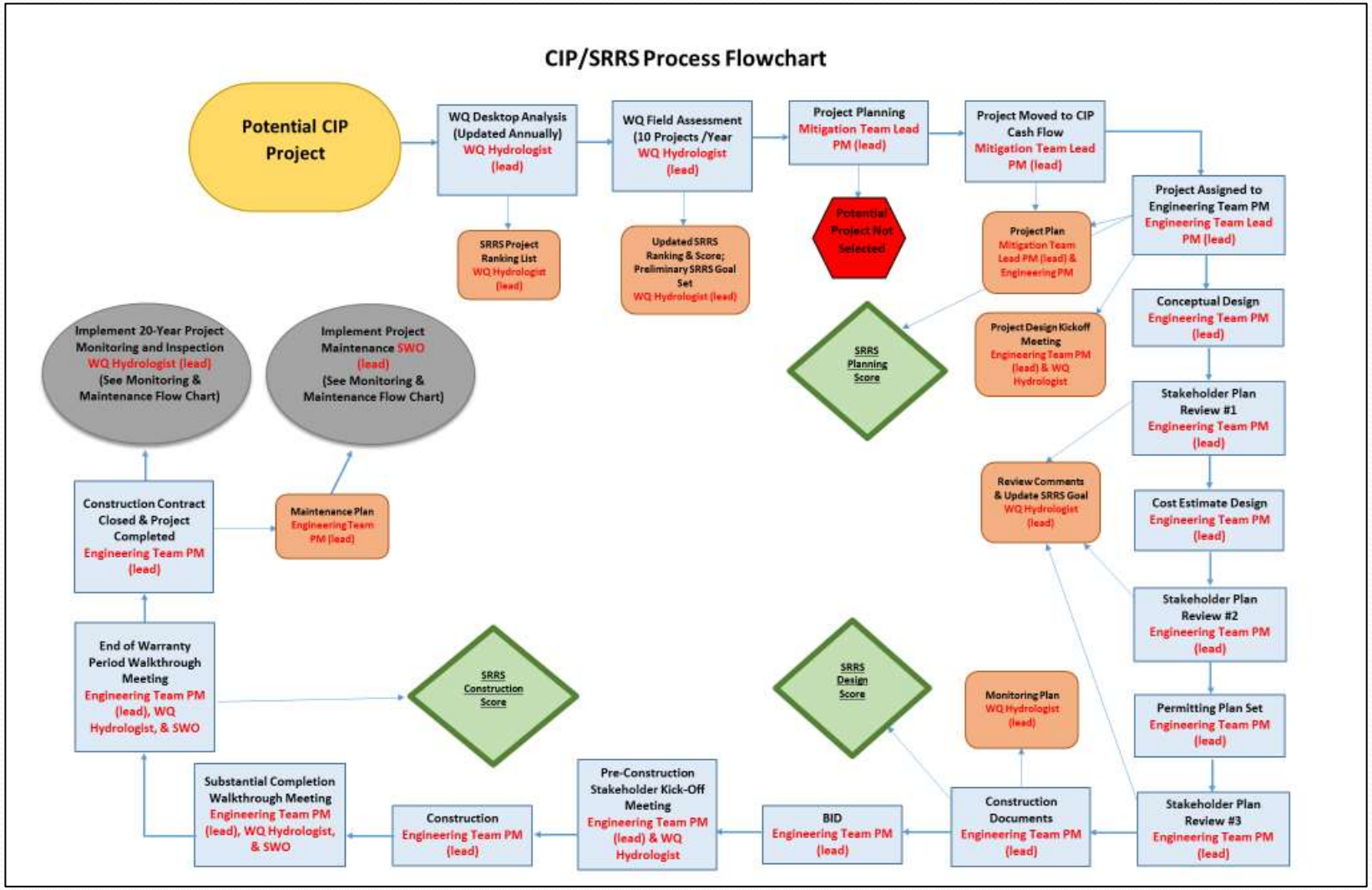

WQ SRRS PROJECT STAGE FIELD SCORE EVALUATION(S)

	Project Name	Reedy Creek Tributary 2			
	Project Torrent	Near 8418 Pine Circle to Confluence with Reedy Creek			
	Project Manager	TBD			
SRRS Field Score Assessment Categories	SRRS Project Field Scores				
	Current Conditions Field Score	150.25			
	Preconstruction Field Score (Potential Uplift)	219.36			
	Design Field Score	N/A			
	Post Construction Field Score	N/A			
Project Survey Data	Stage Evaluation Lengths or Measurements	Current Conditions Stage	Preconstruction (Potential Uplift) Stage	Design Stage	Post Construction Stage
	Evaluation Length (ft.)	251	251		
	Longest Length (ft.)	200	108		
	Longest WS Slope (ft./ft.)	0.006	0.006		
	Field Analysis	Current Conditions Stage Field Score Values	Preconstruction Stage Field Score Values	Design Stage Field Score Values	Post Construction Stage Field Score Values
Stream Dimension	Bank Height Ratio	0.19	1.00		
	Entrenchment Ratio	1.38	2.00		
	Width/Depth Ratio	9.79	13.32		
Stream Profile	Mean Max Pool Depth (ft.)	0.78	1.00		
	Mean Riffle/Run Length (ft.)	0.00	50.00		
Stream Pattern	Sinuosity	1.06	1.15		
	Buffer Quality	14.19	6.59		
Buffer	Buffer Width				
	Preferred (Acres)	21.97	21.97		
	Actual (Acres)	17.97	17.97		
Bank Vegetation	Bank Vegetative Protection	15.00	15.00		
Bank Stability and Nutrients	BEHI (Tons/YR)	32.00	12.88		
	Total Phosphorus (Lbs./YR)	10.84	4.29		
	Total Nitrogen (Lbs./YR)	1.89	0.72		
Habitat Counts	In-stream Cover	12.92	14.00		
Habitat Quality	Epifaunal substrate	11.44	13.00		
Baseflow Water Availability	Baseflow Water Availability	11.83	18.00		

SRRS Scoring Evaluation	Score	SRRS Desktop Ranking
SRRS Desktop Score	*127.34*	*42*
SRRS Current Conditions Field Score	**150.25**	
SRRS Planning Field Score	**219.36**	
Percent uplift	**45%**	

SRRS DESIGN/CONSTRUCTION

- **Project planning**: easements, feasibility and funding availability.
- **Engineering design**: iterative process for design to maximize/meet SRRS score.
- **SRRS Design Score** based on final construction documents.
- **SRRS Construction Score** based on field assessment once construction is completed.

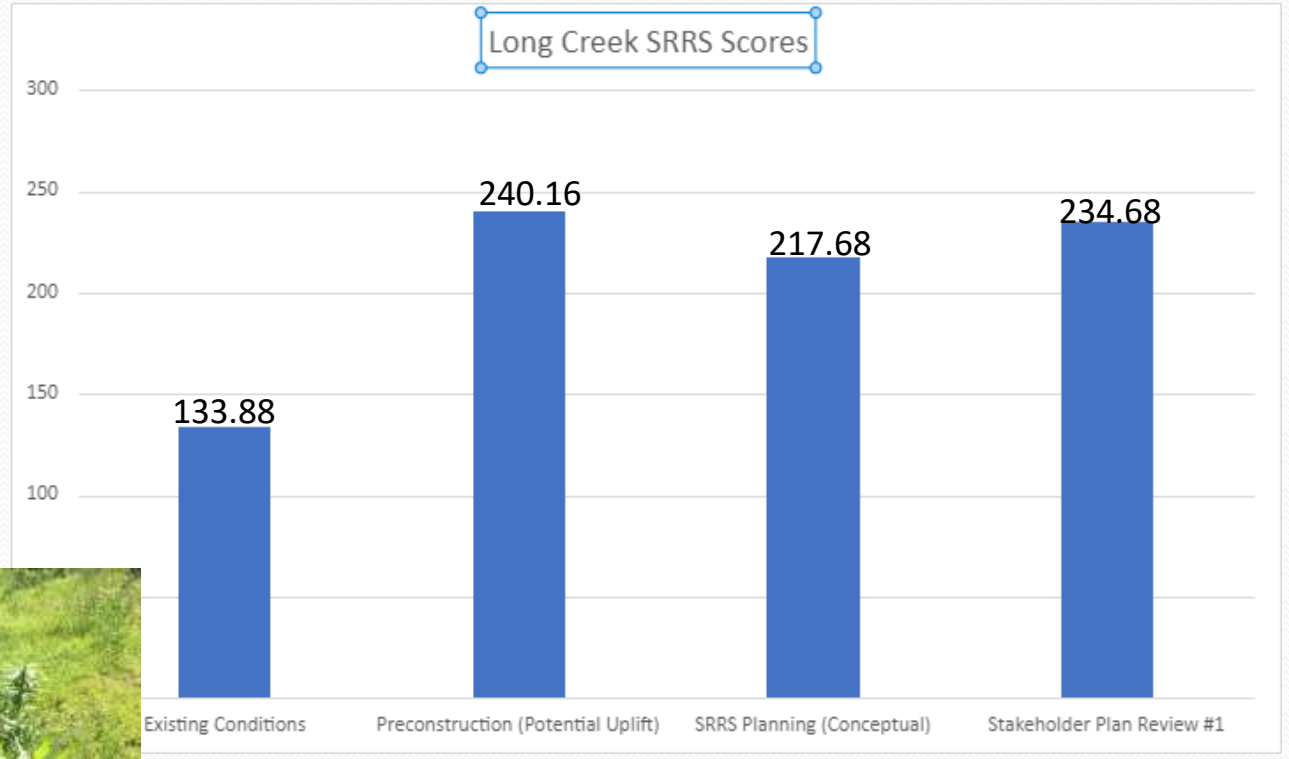


SRRS DESIGN /CONSTRUCTION

Stability Design Modifications:

- Minimize rip-rap along banks
- Increase toe wood
- Juncus plugs along toe
- Increase Buffer Vegetation
- Increase sinuosity
- Geolifts
- Increase flood-prone width

SRRS DESIGN /CONSTRUCTION



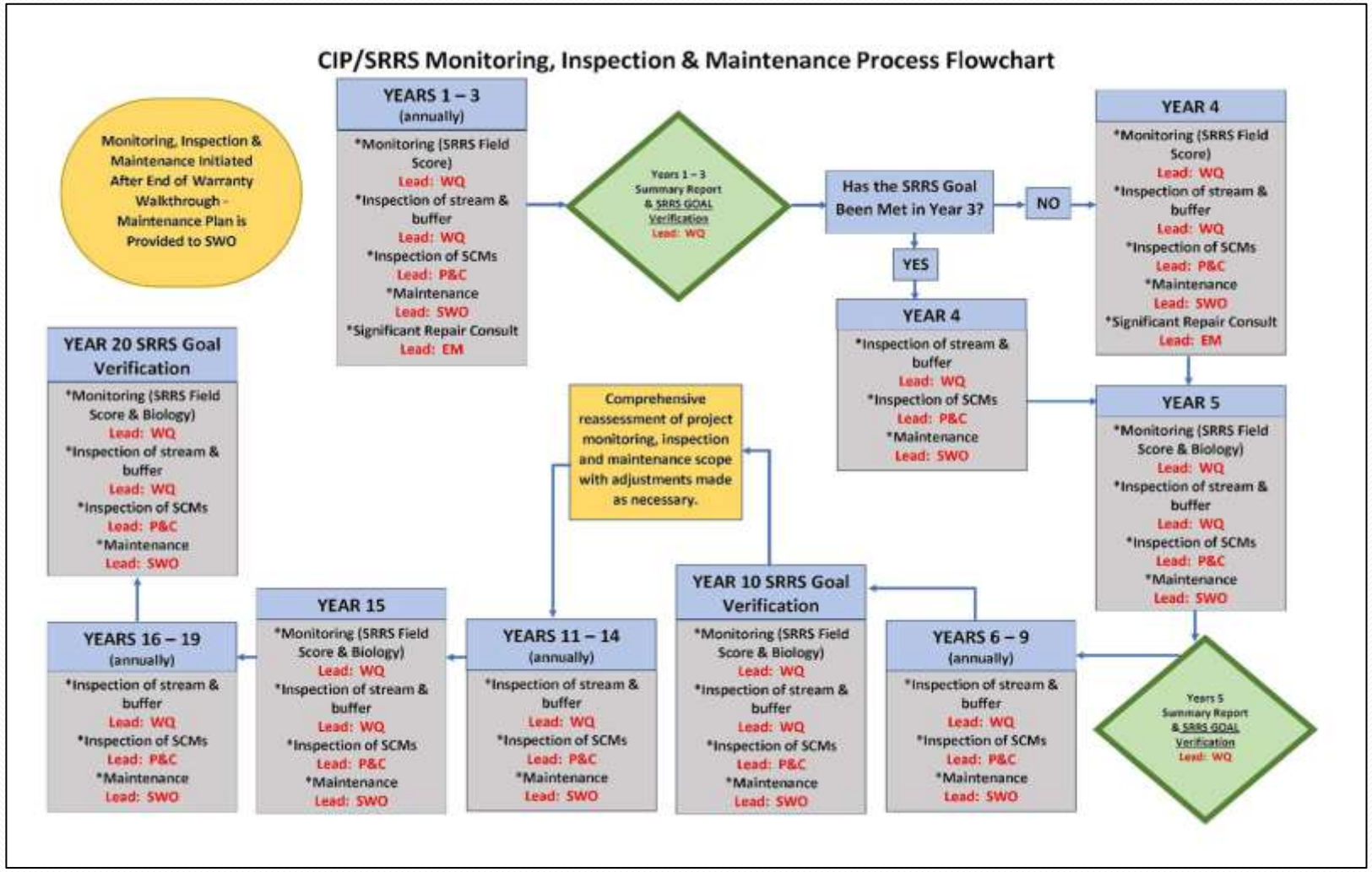
Habitat Design Modifications:

- Maximize riffle-pool sequences
- Larger plant material
- Shorten riffles to steepen to decrease embeddedness
- Increase organic material in stream
- Increase buffer width

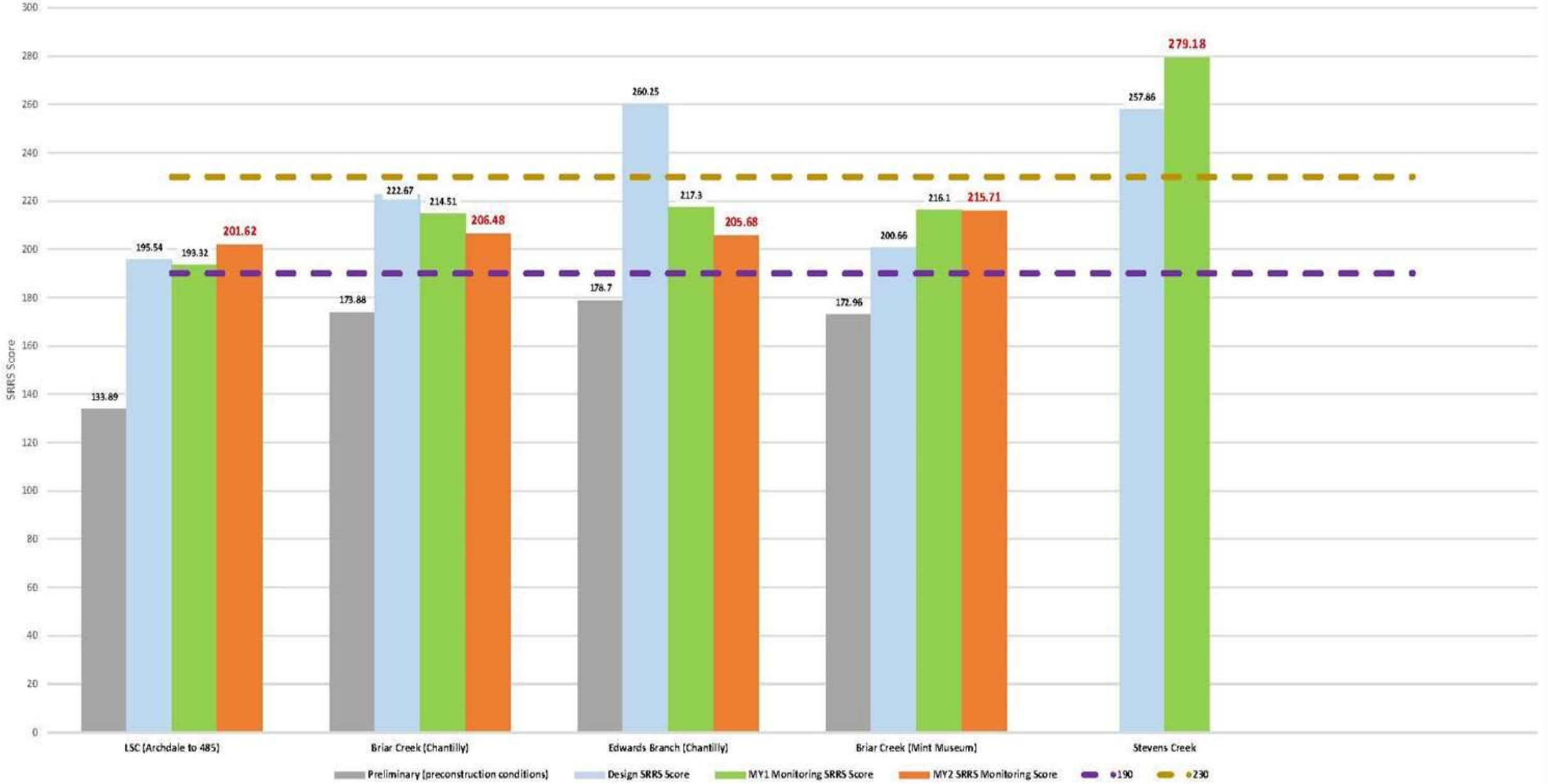
SRRS SUCCESS -- LONG TERM STEWARDSHIP

20 Year Initiative

- **Long Term SRRS Field Score** (MY1-3, MY5, MY10, etc.)
  - Ensures project's score is being met or exceeded.
- **Biology surveys** (i.e., fish and bugs) are completed on five (5) year intervals.
- **Long Term Inspections**
  - Yearly inspections support invasive species management and necessary repairs completed by Storm Water Operations.
- **SRRS EDMS**
  - Internal database allows for data management.



Long Term SRRS Field Scores (Current)



SRRS "take away"

- SRRS is a data-driven process that prioritizes flowing systems with the poorest channel stability and instream habitat for restoration.
- SRRS goals and initiatives have increased CIP funding for future projects.
- SRRS Desktop Score – GIS derived dataset provides support for WQ CIP planning.
- SRRS Field Score – Field evaluation scoring process that helps decide project selection and long-term success.
- Long-term stewardship program – twenty (20) year monitoring/inspection initiative to ensure a project's goal is being met or exceeded.

Still learning what success is!!

QUESTIONS????

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