



Pre-Restoration Stream Assessment for Magnolia Bluffs

Lower Fish River Watershed

April 22, 2024

Submitted to

Mobile Bay National Estuary Program
118 North Royal Street #601
Mobile, Alabama 36602

Thompson Engineering (BVA Group)
Project No.: 23-1126-0013

8060 Cottage Hill Road
Mobile, AL 36695
251.633.6100 ph. / 251.633.6738 fax
www.thompsonengineering.com

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**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

TABLE OF CONTENTS

| | | |
|-----|-----------------------|---|
| 1.0 | INTRODUCTION | 1 |
| 2.0 | METHODS | 2 |
| 3.0 | RESULTS | 4 |
| 4.0 | CONCLUSIONS..... | 6 |
| 5.0 | REFERENCES CITED..... | 7 |

APPENDICES

- Appendix A – Rapid Stream Assessment and Habitat Assessment Data Sheets
- Appendix B – Photographs
- Appendix C – Plant Species Lists

LIST OF FIGURES

| | |
|--|---|
| Figure 1. Location of the Magnolia Bluffs baseline stream assessment | 1 |
| Figure 2. Location of RSA transects at the Magnolia Bluffs sites | 3 |

LIST OF TABLES

| | |
|---|---|
| Table 1. Rapid stream assessment (RSA) metrics and scoring criteria..... | 2 |
| Table 2. RSA scores for the Magnolia Bluffs baseline survey..... | 4 |
| Table 3. Habitat assessment scores for the Magnolia Bluffs baseline survey..... | 5 |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

1.0 INTRODUCTION

The Mobile Bay National Estuary Program funded the project entitled “Lower Fish River Watershed Restoration” through a grant provided by the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund, to address sediment and nutrient issues in a coastal watershed discharging into Weeks Bay. As part of the project, Thompson Engineering, Inc. performed a pre-restoration baseline assessment at four Magnolia Bluffs locations along a reach of the Magnolia River, located south of U.S. Highway 98 in Baldwin County (**Figure 1**). The subject area has steep erosional banks along the river. The restoration project will include the restoration and rehabilitation of approximately 700 linear feet of stream channel and floodplain. The assessment was performed November 9, 2023. Its purpose is to provide baseline ecological information on stream and riparian habitats for comparison with future post-restoration conditions.

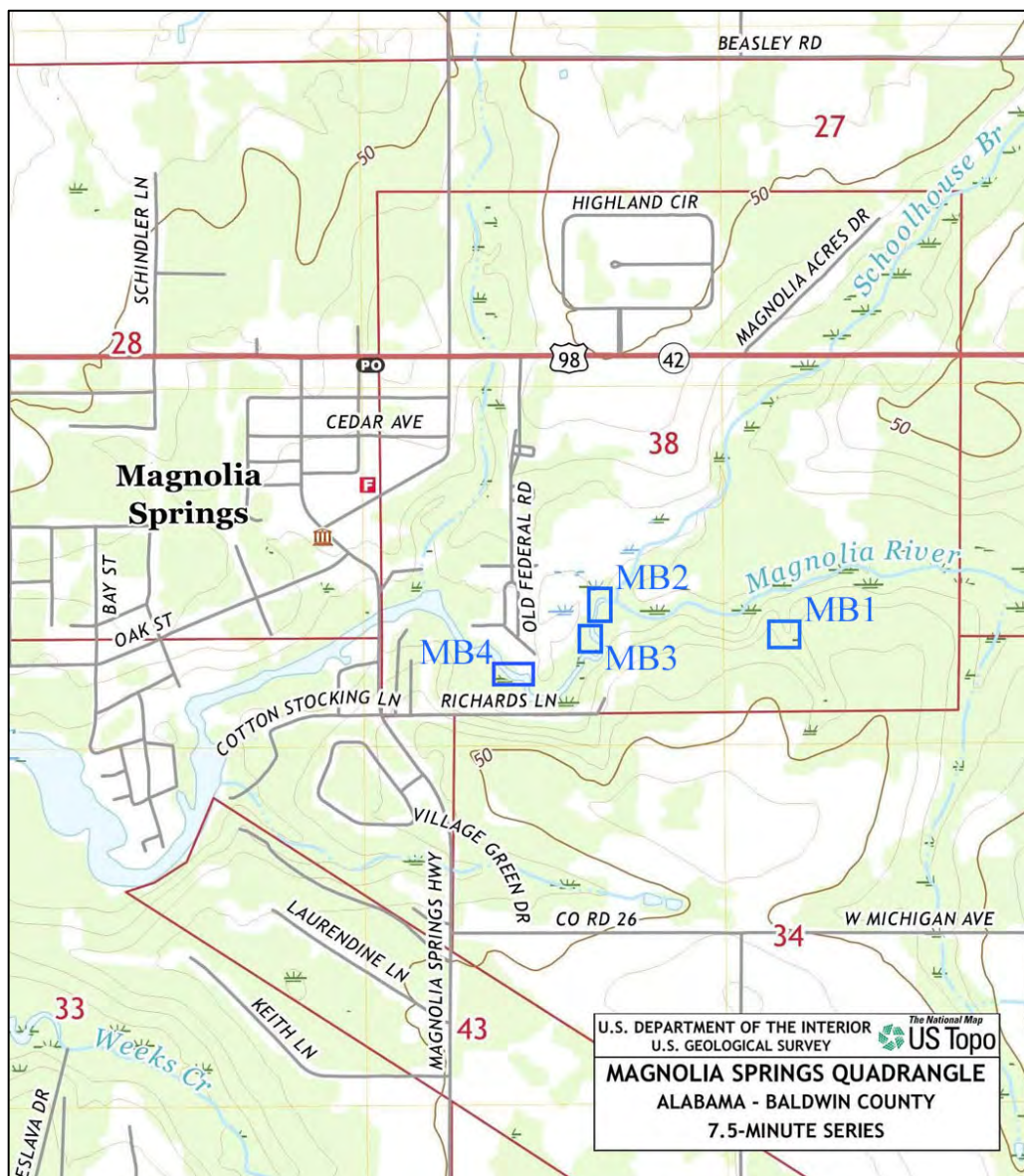


Figure 1. Survey locations for the Magnolia Bluffs (MB) baseline stream assessment.

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

2.0 METHODS

This study used the rapid stream assessment (RSA) method as outlined in the report, *D'Olive Watershed Monitoring Study and Development of a Watershed Condition Framework* (Barry A. Vittor & Associates, Inc., 2019) to assess stream and riparian buffer condition. The RSA combines elements of stream habitat assessment (HAS), wetland rapid assessment procedure (WRAP), and field observations of stream macroinvertebrates. **Table 1** presents each of the RSA metrics and scoring criteria.

Table 1. Rapid stream assessment (RSA) metrics and scoring criteria.

| Metric | Score Criteria | | |
|-----------------------------|---|---|--|
| Riparian Zone Width | Poor (0-9 m) +0 | Moderate (9-18 m) +2 | Good (>18 m) +4 |
| Riparian Vegetative Quality | Poor (0-25% Native) +0 | Moderate (25-75% Native) +2 | Good (>75% Native) +4 |
| Canopy Cover | Poor (<30%, 89-100%) +0 | Moderate (30-50%) +2 | Good (51-88%) +4 |
| Local Watershed Erosion | Heavy +0 | Moderate +2 | Light +4 |
| Sediment Deposition | Poor (>75% of bottom affected) +0 | Moderate (25-75% of bottom affected) +2 | Good (<25% of bottom affected) +4 |
| Habitat Availability | Poor (<10% stable habitat) +0 | Moderate (10-50% stable habitat) +2 | Good (>50% stable habitat) +4 |
| Habitat Smothering | Poor (>75% of habitat affected) +0 | Moderate (25-75% of habitat affected) +2 | Good (<25% of habitat affected) +4 |
| Channel Alteration | Poor (Extensive channelization evident) +0 | Moderate (Some channelization evident) +2 | Good (No channelization evident) +4 |
| Channel Sinuosity | Poor (Straight channel) +0 | Moderate (Some bends in channel) +2 | Good (Extensive bends in channel) +4 |
| Bank Stability | Poor (>60% of banks unstable/eroding) +0 | Moderate (30-60% of banks unstable/eroding) +2 | Good (<30% of banks unstable/eroding) +4 |
| Bank Vegetative Protection | Poor (<50% of streambank with vegetation) +0 | Moderate (50-75% of streambank with vegetation) +2 | Good (>75% of streambank with vegetation) +4 |
| Macroinvertebrates Present | No +0 | Yes +2 | Yes +2 |
| Identified Taxa* | Pollution-Tolerant Taxa -2 | Moderately Pollution-Sensitive Taxa +2 | Pollution-Sensitive Taxa +4 |
| *Taxa Examples | Midge Larvae Midge Pupae Black Fly Rat-tailed Maggot | Caddisfly Damsel Dragonfly Amphipods | Water Penny Stonefly Mayfly Riffle Beetle Dobson Fly |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

Transects approximately 100-m long were surveyed on November 9, 2023. Sites MB2 and MB3 were combined into a single 200-m RSA transect (**Figure 2**). At each assessed reach, standard rapid bioassessment methods were used to collect macroinvertebrates (e.g., using D-frame net sweeps), and the following parameters were noted:

- Presence/absence of macroinvertebrates
- List of any pollution sensitive organisms
- List of any moderately pollution sensitive organisms
- List of pollution-tolerant organisms

Macroinvertebrate attributes were score based on presence (+2) or absence (+0), and if present scored as Poor (-2), Moderate (+2), or Good (+4) based on sensitivity to pollution (**Table 1**). In addition to the RSA, the Alabama Department of Environmental Management (ADEM) stream habitat assessment (HAS) was performed.

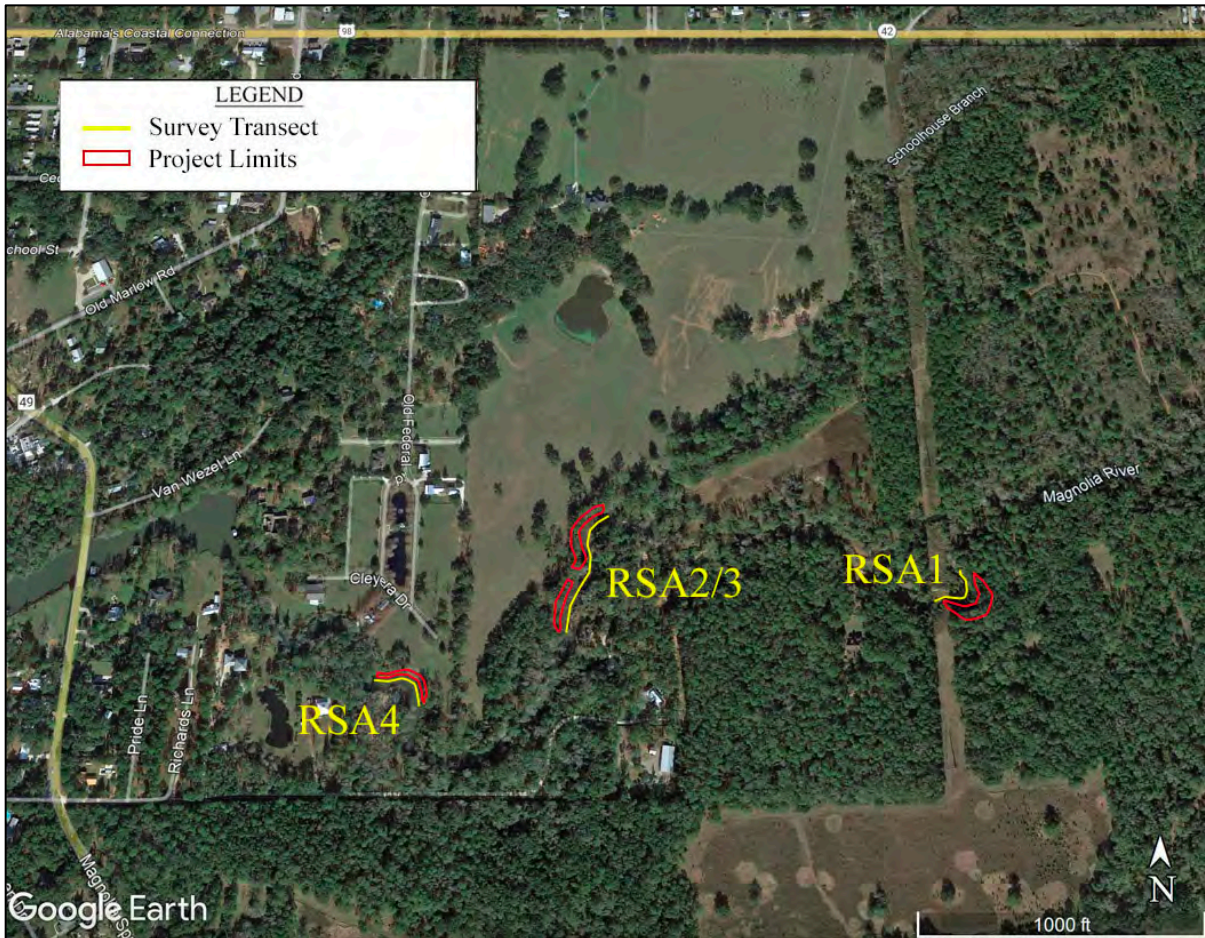


Figure 2. Location of RSA and HAS transects at the Magnolia Bluffs project sites.

RSA and HAS field data sheets are included in **Appendix A**. Site photographs are included in **Appendix B**. Plant species lists are provided in **Appendix C**.

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

3.0 RESULTS

RSA results are presented in **Table 2**. Canopy cover, local watershed erosion, and bank stability all scored as “poor” along the RSA1 transect. The reach has an extremely high, incised bank with bare, eroded dirt on the south side of the river (**Figure 3.1**). Despite the poor condition of the bank, the stream is very clear, with moderate sinuosity, good habitat availability and very little habitat smothering. The RSA1 riparian zone width, in-stream habitat availability, and channel alteration scored as “good”. The remainder of the metrics scored as “moderate”, including riparian vegetative quality, sediment deposition, habitat smothering, channel sinuosity, and bank vegetative protection. The pollution-sensitive stonefly (Plecoptera) was collected at RSA1.



Figure 3.1 Eroded bluff at RSA1 (MB 1)

Table 2. RSA scores for the Schoolhouse Branch baseline survey.

| Metric | RSA1 | RSA2/3 | RSA4 |
|-----------------------------------|---------------|----------------|------|
| Riparian Zone Width | 4 | 2 | 0 |
| Riparian Vegetative Quality | 2 | 2 | 2 |
| Canopy Cover | 0 | 0 | 0 |
| Local Watershed Erosion | 0 | 2 | 0 |
| Sediment Deposition | 2 | 2 | 2 |
| Habitat Availability | 4 | 2 | 2 |
| Habitat Smothering | 2 | 2 | 2 |
| Channel Alteration | 4 | 4 | 4 |
| Channel Sinuosity | 2 | 2 | 2 |
| Bank Stability | 0 | 2 | 0 |
| Bank Vegetative Protection | 2 | 2 | 2 |
| Macroinvertebrates Present | 2 | 2 | 0 |
| Identified Taxa* | 4 | 2 | 0 |
| | | | |
| *Specific Taxa | Stonefly (+4) | Dragonfly (+2) | |
| | | | |
| Total | 28 | 26 | 16 |
| Scaled based on 50-pt Max. | 0.56 | 0.52 | 0.32 |

RSA2/3 received a “poor” score only for canopy cover. It had a “good” channel alteration score, indicating little to no channelization in the stream. Overall, even in a wider area of MB 2 with low flow, there was very little habitat smothering. Habitat availability was less here than MB 1, but mostly because it is a wide reach with mostly bare sand. There is good bank vegetation along this reach (**Figure 3.2**), and good water clarity at the time of the survey (**Appendix B, Photo B2** and **Photo B5**). The remainder of the metrics scored as “moderate”. The RSA2/3 reach yielded one taxon, dragonfly (Odonata), within the moderately pollution-sensitive category (**Table 2**).

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

The RSA4 transect received “poor” scores for riparian zone width, canopy cover, local watershed erosion, bank stability, and macroinvertebrate presence. Most of the rest of the RSA metrics scored “moderate”. Like the two upstream reaches, RSA4 had a “good” channel alteration score.

Total points were 28, 26, and 16 points for RSA1, RSA2/3, and RSA4, respectively. Scaled to the maximum achievable 50 points, the transects scored 0.56, 0.52, and 0.32, respectively. All three sites have varying degrees of degradation, with RSA1 and 2/3 in the lower part of the fair-quality range (i.e., 0.74-0.51) and RSA4 with poor quality (≤ 0.50) (**Table 2**).



Figure 3.2 Vegetated banks along RSA2/3 (MB 2)

Table 3 presents the HAS scores. For RSA1, the condition of the stream banks, channel flow status, and bank vegetative protection of the right (north) bank received the lowest scores proportionate to the highest achievable values. The remainder of the HAS parameters scored relatively well. The riparian vegetation zone scored high for the reach as a whole.

RSA2/3 (MB 2 and MB 3) received low scores for instream cover (= RSA habitat availability) channel sinuosity, and condition of the banks. Several areas of the reach area have bank instability and eroded areas of the river bluff (**Figure 3.2**), despite having generally good bank vegetation and riparian zone, and generally minor habitat smothering. RSA2/3 had moderate scores for pool variability and riparian zone width (right bank).

Table 3. Habitat assessment scores for the Schoolhouse Branch baseline survey.

| Habitat Parameter | Max Score | RSA1 | RSA2/3 | RSA4 |
|---|------------|------------|------------|------------|
| Instream Cover | 20 | 17 | 10 | 11 |
| Pool Substrate Characterization | 20 | 18 | 16 | 16 |
| Pool Variability | 20 | 17 | 13 | 12 |
| Channel Alteration | 20 | 19 | 19 | 19 |
| Sediment Deposition | 20 | 15 | 16 | 13 |
| Channel Sinuosity | 20 | 16 | 10 | 15 |
| Channel Flow Status | 20 | 7 | 15 | 11 |
| Condition of Banks | 20 | 5 | 11 | 6 |
| Bank Vegetative Protection (Left Bank) | 10 | 8 | 7 | 7 |
| Bank Vegetative Protection (Right Bank) | 10 | 4 | 7 | 4 |
| Grazing or Other Disruptive Pressure (Left Bank) | 10 | 9 | 8 | 7 |
| Grazing or Other Disruptive Pressure (Right Bank) | 10 | 9 | 8 | 5 |
| Riparian Vegetative Zone Width (Left Bank) | 10 | 10 | 6 | 2 |
| Riparian Vegetative Zone Width (Right Bank) | 10 | 10 | 10 | 4 |
| Total | 220 | 164 | 156 | 132 |

MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT LOWER FISH RIVER WATERSHED

RSA4 received low scores for instream cover, channel flow status, and condition of its banks, as well as bank vegetative protection. The riparian zone and the right bank in particular are in poor condition (**Figure 3.3**). Riparian vegetative zone width scored poorly on both sides of the highly degraded portion of the RSA4 reach (**Table 3**).



Figure 3.3 Poor quality bank condition at RSA4 (MB 4)

No wetlands were delineated within the project limits. A list of plant species observed along the survey transects is provided in **Appendix C**. Invasive plants are prevalent throughout the project area. A total of 18 non-native plants were observed during the survey. Species observed at all three transects included Japanese climbing fern (*Lygodium japonicum*), camphor tree (*Camphora officinarum*), cogongrass (*Imperata cylindrica*), Chinese tallow tree (*Triadica sebifera*), West Indian chickweed (*Drymaria cordata*), and Japanese honeysuckle (*Lonicera japonica*).

Conclusions

The MB1 reach overall had clear water, good sinuosity and habitat availability, with little habitat smothering, despite the high and incised left bank with bare, eroded dirt. MB1 scored the best of all four survey transects for riparian zone width and vegetation.

The Bluff 2 reach is relatively shallow upstream and abruptly transitions to deeper water downstream. Portions of the Bluff 2 reach had good water clarity and bank vegetation, with a sandy bottom and minor habitat smothering. Overall, there is generally good condition bank vegetation and riparian zone. The stream is much wider in the Bluff 2 and 3 area and some locations are unwadeable and difficult to survey.

The Bluff 3 reach has eroded areas in the riparian zone, with bluff and bank instability. Downstream portions of the reach are deep, with good sinuosity and in some locations good bank stability and vegetative protection. Overall, there is a generally good condition of the riparian zone.

The Magnolia Bluff 4 reach was challenging to survey, particularly for instream habitat availability, due to the width and depth of the stream. Bluff 4 contains the poorest condition bank and riparian zone of the surveyed reaches. The remaining areas of the reach are generally in good to moderate condition, including for bank stability and bank vegetative protection.

The baseline survey at the Magnolia Bluffs sites is intended to establish a background set of habitat assessment data for comparison with post-restoration conditions. Stream bank condition and stability scored poorly for all the surveyed transects. Canopy cover scored poorly overall, due to wide stream reaches in the survey area. The stream condition metrics most likely to improve after restoration are those related to bluff erosion and related sediment deposition, bank vegetation and stability, riparian zone width, and coverage of invasive plants.

5.0 REFERENCES CITED

Barry A. Vittor & Associates, Inc., 2019. *D'Olive Watershed Monitoring Study and Development of a Watershed Condition Framework*. Report prepared for the Mobile Bay National Estuary Program. 29 pp. + appendices.

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***

Appendix A – Rapid Stream Assessment and Habitat Assessment Data Sheets

Lower Fish River Watershed Data Sheet

Station Name/Number Magnolia Bluff - 1 Date 11/10/23

Field Personnel JD, MJ, HH Weather overcast, warm

Riparian Buffer Zone Width: Poor (0-9m) _____ Moderate (9-18m) _____ Good (>18m) X

Riparian Veg. Quality: Poor (0-25% Native) _____ Moderate (25-75% Native) X Good (>75% Native) _____

Water Quality: Water Temp (°C) _____ Cond. (µmohs/cm) _____ Sal. (ppt) _____ pH _____

DO (mg/L) _____ DO (%) _____ Turbidity (NTU) _____

Dominant Watershed Land Use: Forest X Field/Pasture _____ Agriculture _____ Residential _____

Commercial _____ Industrial _____ Other _____

Canopy Cover: Poor (<30%, 89-100%) X Moderate (30-50%) _____ Good (51-88%) _____

Local Watershed Erosion: None _____ Light _____ Moderate _____ Heavy X

Sediment Deposition: Poor _____ Moderate X Good _____

Habitat Availability: Poor _____ Moderate _____ Good X

Habitat Smothering: Poor _____ Moderate X Good _____

Channel Alteration (Artificial Channelization): Poor _____ Moderate _____ Good X

Channel Sinuosity: Poor _____ Moderate X Good _____

Bank Stability: Poor X Moderate _____ Good _____

Bank Veg. Protection: Poor _____ Moderate X Good _____

Macroinvertebrates Present: Yes X No _____

Circle Identified Taxa (refer to attached ID guide)

| Pollution Sensitive |
|---------------------|
| Water Penny |
| <u>Stonefly</u> |
| Mayfly |
| Riffle Beetle |
| Dobson fly |

| Mod. Pollution Sensitive |
|--------------------------|
| Caddisfly |
| Damselfly |
| Dragonfly |
| Amphipods |

| Pollution Tolerant |
|--------------------|
| Midge Larvae |
| Midge Pupae |
| Black Fly |
| Rat-tailed Maggot |

Notes: American eel, crawfish collected

Appendix K. ADEM - Field Operations Division Glide/Pool habitat assessment field data sheet

Magnolia Bluff - 1
11/10/23

| Habitat Parameter | Category | | | |
|---|---|--|---|--|
| | Optimal | Suboptimal | Marginal | Poor |
| 1 Instream Cover | > 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present. | 50-30% mix of stable habitat; adequate habitat for maintenance of populations. | 30-10% mix of stable habitat; habitat availability less than desirable. | <10% stable habitat; lack of habitat is obvious. |
| Score 17 | 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 substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common. | Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present. | All mud or clay or sand bottom; little or no root mat; no submerged vegetation. | Hard-pan clay or bedrock; no root mat or vegetation. |
| Score 18 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 3 Pool Variability | Even mix of large-shallow, large-deep, 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 pools absent. |
| Score 17 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 4 Man-made Channel Alteration | No Channelization or dredging present. | Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent. | New embankments present on both banks; channelization may be extensive, usually in urban or agriculture lands; and > 80% of stream reach is channelized and disrupted. | Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely. |
| Score 19 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 5 Sediment Deposition | <20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars. | 20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation. | 50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events. | Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to deposition. |
| Score 15 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 6 Channel Sinuosity | Bends in stream increase stream length 3 to 4 times longer than if it was in a straight line. | Bends in stream increase stream length 2 to 3 times longer than if it was in a straight line. | Bends in stream increase the stream length 2 to 1 times longer than if it was in a straight line. | Channel straight; waterway has been channelized for a long distance. |
| Score 16 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 7 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. | Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed. | Very little water in channel and mostly present as standing pools. |
| Score 7 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 8 Condition of Banks | Banks stable; no evidence of erosion or bank failure; <5% affected. | Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% affected. | Moderately unstable; 30-60% of banks in reach have areas of erosion. | Unstable; many eroded areas; "raw" areas frequent along straight section and bends; on side slopes, 60-100% of bank has erosional scars. |
| Score 5 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 9 Bank Vegetative Protection (each bank) | > 90% of the stream bank surfaces covered by vegetation. | 90-70% of the streambank surfaces covered by vegetation. | 70-50% of the stream bank surfaces covered by vegetation. | <50% of the streambank surfaces covered by vegetation. |
| Score (LB) 8 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 4 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 10 Grazing or other disruptive pressure (each bank) | Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally. | Disruption evident but not affecting full plant growth potential to any great extent; >1/2 of the potential plant stubble height remaining. | Disruption obvious; patches of bare soil or closely cropped vegetation common; <1/2 of the potential plant stubble height remaining. | Disruption of stream bank vegetation is very high; vegetation has been removed to ≤ 2 inches average stubble height. |
| Score (LB) 9 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 9 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 11 Riparian vegetative zone Width (each bank) | Width of riparian zone >60 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone. | Width of riparian zone 60 - 40 feet; human activities have impacted zone only minimally. | Width of riparian zone 40 - 20 feet; human activities have impacted zone a great deal. | Width of riparian zone <20 feet; little or no riparian vegetation due to human activities. |
| Score (LB) 10 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 10 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |

Lower Fish River Watershed Data Sheet

Station Name/Number Magnolia Bluffs 213 Date 11/9/23

Field Personnel JO, MS, HH Weather Sunny, warm 78°

Riparian Buffer Zone Width: Poor (0-9m) _____ Moderate (9-18m) ^{left} _____ Good (>18m) ^{right} _____

Riparian Veg. Quality: Poor (0-25% Native) _____ Moderate (25-75% Native) _____ Good (>75% Native) _____

Water Quality: Water Temp (°C) _____ Cond. (µmohs/cm) _____ Sal. (ppt) _____ pH _____

DO (mg/L) _____ DO (%) _____ Turbidity (NTU) _____

Dominant Watershed Land Use: Forest ^{right} Field/Pasture ^{left} Agriculture _____ Residential _____
Commercial _____ Industrial _____ Other _____

Canopy Cover: Poor (<30%, 89-100%) Moderate (30-50%) _____ Good (51-88%) _____

Local Watershed Erosion: None _____ Light _____ Moderate Heavy _____

Sediment Deposition: Poor _____ Moderate Good _____

Habitat Availability: Poor _____ Moderate Good _____

Habitat Smothering: Poor _____ Moderate Good _____

Channel Alteration (Artificial Channelization): Poor _____ Moderate _____ Good _____

Channel Sinuosity: Poor _____ Moderate Good _____

Bank Stability: Poor _____ Moderate Good _____

Bank Veg. Protection: Poor _____ Moderate Good _____

Macroinvertebrates Present: Yes No _____

Circle Identified Taxa (refer to attached ID guide)

| Pollution Sensitive | Mod. Pollution Sensitive | Pollution Tolerant |
|---------------------|--------------------------|--------------------|
| Water Penny | Caddisfly | Midge Larvae |
| Stonefly | Damselfly | Midge Pupae |
| Mayfly | <u>Dragonfly</u> | Black Fly |
| Riffle Beetle | Amphipods | Rat-tailed Maggot |
| Dobson fly | | |

Notes: _____

Appendix K. ADEM - Field Operations Division Glide/Pool habitat assessment field data sheet

Magnolia Bluff 2.3
11/9/23

| Habitat Parameter | Category | | | |
|---|---|--|---|--|
| | Optimal | Suboptimal | Marginal | Poor |
| 1 Instream Cover | > 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present. | 50-30% mix of stable habitat; adequate habitat for maintenance of populations. | 30-10% mix of stable habitat; habitat availability less than desirable. | <10% stable habitat; lack of habitat is obvious. |
| Score 10 | 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 substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common. | Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present. | All mud or clay or sand bottom; little or no root mat; no submerged vegetation. | Hard-pan clay or bedrock; no root mat or vegetation. |
| Score 16 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 3 Pool Variability | Even mix of large-shallow, large-deep, 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 pools absent. |
| Score 13 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 4 Man-made Channel Alteration | No Channelization or dredging present. | Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent. | New embankments present on both banks; channelization may be extensive, usually in urban or agriculture lands; and > 80% of stream reach is channelized and disrupted. | Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely. |
| Score 19 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 5 Sediment Deposition | <20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars. | 20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation. | 50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events. | Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to deposition. |
| Score 16 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 6 Channel Sinuosity | Bends in stream increase stream length 3 to 4 times longer than if it was in a straight line. | Bends in stream increase stream length 2 to 3 times longer than if it was in a straight line. | Bends in stream increase the stream length 2 to 1 times longer than if it was in a straight line. | Channel straight; waterway has been channelized for a long distance. |
| Score 10 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 7 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. | Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed. | Very little water in channel and mostly present as standing pools. |
| Score 15 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 8 Condition of Banks | Banks stable; no evidence of erosion or bank failure; <5% affected. | Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% affected. | Moderately unstable; 30-60% of banks in reach have areas of erosion. | Unstable; many eroded areas; "raw" areas frequent along straight section and bends; on side slopes, 60-100% of bank has erosional scars. |
| Score 11 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 9 Bank Vegetative Protection (each bank) | >90% of the stream bank surfaces covered by vegetation. | 90-70% of the streambank surfaces covered by vegetation. | 70-50% of the stream bank surfaces covered by vegetation. | <50% of the streambank surfaces covered by vegetation. |
| Score (LB) 7 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 7 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 10 Grazing or other disruptive pressure (each bank) | Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally. | Disruption evident but not affecting full plant growth potential to any great extent; >1/2 of the potential plant stubble height remaining. | Disruption obvious; patches of bare soil or closely cropped vegetation common; <1/2 of the potential plant stubble height remaining. | Disruption of stream bank vegetation is very high; vegetation has been removed to ≤ 2 inches average stubble height. |
| Score (LB) 8 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 8 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 11 Riparian vegetative zone Width (each bank) | Width of riparian zone >60 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone. | Width of riparian zone 60 - 40 feet; human activities have impacted zone only minimally. | Width of riparian zone 40 - 20 feet; human activities have impacted zone a great deal. | Width of riparian zone <20 feet; little or no riparian vegetation due to human activities. |
| Score (LB) 6 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 10 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |

Lower Fish River Watershed Data Sheet

Station Name/Number Magnolia Bluff 4 Date 11/10/23

Field Personnel Jo, MS, HH Weather overcast, warm

Riparian Buffer Zone Width: Poor (0-9m) Moderate (9-18m) _____ Good (>18m) _____

Riparian Veg. Quality: Poor (0-25% Native) _____ Moderate (25-75% Native) Good (>75% Native) _____

Water Quality: Water Temp (°C) 20.8 Cond. (µmohs/cm) 128 Sal. (ppt) 0.06 pH 6.84

DO (mg/L) 7.71 DO (%) 86.2 Turbidity (NTU) _____

Dominant Watershed Land Use: Forest _____ Field/Pasture _____ Agriculture _____ Residential

Commercial _____ Industrial _____ Other _____

Canopy Cover: Poor (<30%, 89-100%) Moderate (30-50%) _____ Good (51-88%) _____

Local Watershed Erosion: None _____ Light _____ Moderate _____ Heavy

Sediment Deposition: Poor _____ Moderate Good _____

Habitat Availability: Poor _____ Moderate Good _____

Habitat Smothering: Poor _____ Moderate Good _____

Channel Alteration (Artificial Channelization): Poor _____ Moderate _____ Good

Channel Sinuosity: Poor _____ Moderate Good _____

Bank Stability: Poor Moderate Good _____

Bank Veg. Protection: Poor _____ Moderate Good _____

Macroinvertebrates Present: Yes _____ No

Circle Identified Taxa (refer to attached ID guide)

| Pollution Sensitive |
|---------------------|
| Water Penny |
| Stonefly |
| Mayfly |
| Riffle Beetle |
| Dobson fly |

| Mod. Pollution Sensitive |
|--------------------------|
| Caddisfly |
| Damselfly |
| Dragonfly |
| Amphipods |

| Pollution Tolerant |
|--------------------|
| Midge Larvae |
| Midge Pupae |
| Black Fly |
| Rat-tailed Maggot |

Notes: A lot of this reach was unwadeable. Difficult to access habitat.
Macro data should be taken w/ caution

Appendix K. ADEM - Field Operations Division Glide/Pool habitat assessment field data sheet

Mogul Bluff 4
11/10/23

| Habitat Parameter | Category | | | |
|---|---|--|---|--|
| | Optimal | Suboptimal | Marginal | Poor |
| 1 Instream Cover | > 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present. | 50-30% mix of stable habitat; adequate habitat for maintenance of populations. | 30-10% mix of stable habitat; habitat availability less than desirable. | <10% stable habitat; lack of habitat is obvious. |
| Score 11 | 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 substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common. | Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present. | All mud or clay or sand bottom; little or no root mat; no submerged vegetation. | Hard-pan clay or bedrock; no root mat or vegetation. |
| Score 16 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 3 Pool Variability | Even mix of large-shallow, large-deep, 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 pools absent. |
| Score 12 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 4 Man-made Channel Alteration | No Channelization or dredging present. | Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent. | New embankments present on both banks; channelization may be extensive, usually in urban or agriculture lands; and > 80% of stream reach is channelized and disrupted. | Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely. |
| Score 19 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 5 Sediment Deposition | <20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars. | 20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation. | 50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events. | Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to deposition. |
| Score 13 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 6 Channel Sinuosity | Bends in stream increase stream length 3 to 4 times longer than if it was in a straight line. | Bends in stream increase stream length 2 to 3 times longer than if it was in a straight line. | Bends in stream increase the stream length 2 to 1 times longer than if it was in a straight line. | Channel straight; waterway has been channelized for a long distance. |
| Score 15 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 7 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. | Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed. | Very little water in channel and mostly present as standing pools. |
| Score 11 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 8 Condition of Banks | Banks stable; no evidence of erosion or bank failure; <5% affected. | Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% affected. | Moderately unstable; 30-60% of banks in reach have areas of erosion. | Unstable; many eroded areas; "raw" areas frequent along straight section and bends; on side slopes, 60-100% of bank has erosional scars. |
| Score 6 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 0 |
| 9 Bank Vegetative Protection (each bank) | > 90% of the stream bank surfaces covered by vegetation. | 90-70% of the streambank surfaces covered by vegetation. | 70-50% of the stream bank surfaces covered by vegetation. | <50% of the streambank surfaces covered by vegetation. |
| Score (LB) 7 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 4 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 10 Grazing or other disruptive pressure (each bank) | Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally. | Disruption evident but not affecting full plant growth potential to any great extent; >1/2 of the potential plant stubble height remaining. | Disruption obvious; patches of bare soil or closely cropped vegetation common; <1/2 of the potential plant stubble height remaining. | Disruption of stream bank vegetation is very high; vegetation has been removed to ≤ 2 inches average stubble height. |
| Score (LB) 7 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 5 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| 11 Riparian vegetative zone Width (each bank) | Width of riparian zone >60 feet; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone. | Width of riparian zone 60 - 40 feet; human activities have impacted zone only minimally. | Width of riparian zone 40 - 20 feet; human activities have impacted zone a great deal. | Width of riparian zone <20 feet; little or no riparian vegetation due to human activities. |
| Score (LB) 2 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |
| Score (RB) 4 | 10 9 8 | 7 6 | 5 4 3 | 2 1 0 |

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***

Appendix B – Photographs

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***



Photo B1. Bluff 1, view downstream near the upstream portion of the RSA1 survey reach.



Photo B2. Bluff 2, uppermost portion of the survey transect.

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***



Photo B3. Bluff 2, downstream view, mid-transect.



Photo B4. Bluff 2 downstream portion of the survey transect with eroding bluff.

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**



Photo B5. Approximate mid-point of the Bluff 3 survey reach.



Photo B6. Bluff 3, view downstream near the end of the RSA2/3 survey transect.

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***



Photo B7. RSA2/3, downstream end of the survey transect (Bluff 3).



Photo B8. Bluff 4, downstream end of the survey transect.

***MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED***

Appendix C – Plant Species Lists

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

Transect MB1 - Plant Species List († = non-native)

| Order | Family | Species Name | Common Name |
|----------------|-----------------|-----------------------------------|----------------------------|
| Osmundales | Osmundaceae | <i>Osmundastrum cinnamomeum</i> | Cinnamon fern |
| Schizaeles | Lygodiaceae | <i>Lygodium japonicum</i> † | Japanese climbing fern |
| Polypodiales | Blechnaceae | <i>Lorinseria areolata</i> | Netted chain fern |
| Pinales | Cupressaceae | <i>Chamaecyparis thyoides</i> | Atlantic white cedar |
| Lurales | Lauraceae | <i>Camphora officinarum</i> † | Camphor tree |
| Liliales | Smilacaceae | <i>Smilax auriculata</i> | Dune greenbrier |
| Liliales | Smilacaceae | <i>Smilax bona-nox</i> | Saw greenbrier |
| Liliales | Smilacaceae | <i>Smilax glauca</i> | White-leaf greenbrier |
| Liliales | Smilacaceae | <i>Smilax pumila</i> | Sarsaparilla vine |
| Arecales | Arecaceae | <i>Serenoa repens</i> | Saw palmetto |
| Poales | Poaceae | <i>Arundinaria gigantea</i> | Giant cane, River cane |
| Poales | Poaceae | <i>Axonopus fissifolius</i> | Common carpet grass |
| Poales | Poaceae | <i>Chasmanthium sessiliflorum</i> | Long-leaf spikegrass |
| Poales | Poaceae | <i>Imperata cylindrica</i> † | Cogon grass |
| Poales | Poaceae | <i>Kelochloa verrucosa</i> | Warty panic grass |
| Saxifragales | Iteaceae | <i>Itea virginica</i> | Virginia sweetspire |
| Vitales | Vitaceae | <i>Muscadinia rotundifolia</i> | Muscadine |
| Rosales | Rosaceae | <i>Rubus pensilvanicus</i> | Pennsylvania blackberry |
| Rosales | Rosaceae | <i>Rubus trivialis</i> | Southern dewberry |
| Fagales | Fafaceae | <i>Quercus hemisphaerica</i> | Sand laurel oak |
| Fagales | Fafaceae | <i>Quercus nigra</i> | Water oak |
| Fagales | Fafaceae | <i>Quercus virginiana</i> | Live oak |
| Magpighiales | Hypericaceae | <i>Hypericum hypericoides</i> | St. Andrew's Cross |
| Magpighiales | Euphorbiaceae | <i>Triadica sebifera</i> † | Chinese tallow tree |
| Magpighiales | Phyllanthaceae | <i>Embllica urinaria</i> † | Pee flower, chamber bitter |
| Caryophyllales | Caryophyllaceae | <i>Drymaria cordata</i> † | West Indian chickweed |
| Ericales | Cyrtillaceae | <i>Cyrilla racemiflora</i> | Swamp titi |
| Ericales | Ericaceae | <i>Vaccinium arboreum</i> | Sparkleberry |
| Ericales | Ericaceae | <i>Vaccinium elliotii</i> | Elliot's blueberry |
| Ericales | Ericaceae | <i>Vaccinium fuscatum</i> | Black highbush blueberry |
| Gentianales | Rubiaceae | <i>Mitchella repens</i> | Partridge berry |
| Solanales | Convolvulaceae | <i>Jacquemontia tamnifolia</i> | Hairy cluster vine |
| Lamiales | Lamiaceae | <i>Callicarpa americana</i> | American beautyberry |
| Aquifoliales | Aquifoliaceae | <i>Ilex vomitoria</i> | Yaupon |
| Asterales | Asteraceae | <i>Baccharis halimifolia</i> | Groundsel bush |
| Asterales | Asteraceae | <i>Conoclinium coelestinum</i> | Blue mistflower |
| Asterales | Asteraceae | <i>Erechtites hieraciifolius</i> | Fireweed |
| Asterales | Asteraceae | <i>Erigeron pusillus</i> | Southern horseweed |
| Asterales | Asteraceae | <i>Eupatorium capillifolium</i> | Common dog fennel |
| Asterales | Asteraceae | <i>Mikania scandens</i> | Climbing hempvine |
| Asterales | Asteraceae | <i>Trilisa odoratissima</i> | Deer's tongue |
| Dipsacales | Viburnaceae | <i>Sambucus canadensis</i> | Common elderberry |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

| | | | |
|------------|----------------|----------------------------|----------------------|
| Dipsacales | Caprifoliaceae | <i>Lonicera japonica</i> † | Japanese honeysuckle |
|------------|----------------|----------------------------|----------------------|

Transect MB2/3 - Plant Species List († = non-native)

| Order | Family | Species Name | Common Name |
|----------------|-----------------|--|----------------------------|
| Schizaeles | Lygodiaceae | <i>Lygodium japonicum</i> † | Japanese climbing fern |
| Polypodiales | Blechnaceae | <i>Lorinseria areolata</i> | Netted chain fern |
| Polypodiales | Athyriaceae | <i>Deparia petersenii</i> † | Japanese lady fern |
| Pinales | Cupressaceae | <i>Chamaecyparis thyoides</i> | Atlantic white cedar |
| Magnoliales | Magnoliaceae | <i>Magnolia virginiana</i> var. <i>australis</i> | Southern sweet bay |
| Laurales | Lauraceae | <i>Camphora officinarum</i> † | Camphor tree |
| Liliales | Smilacaceae | <i>Smilax bona-nox</i> | Saw greenbrier |
| Liliales | Smilacaceae | <i>Smilax glauca</i> | White-leaf greenbrier |
| Liliales | Smilacaceae | <i>Smilax rotundifolia</i> | Round-leaf greenbrier |
| Poales | Juncaceae | <i>Juncus effusus</i> | Soft rush |
| Poales | Poaceae | <i>Chasmanthium laxum</i> | Slender wood oats |
| Poales | Poaceae | <i>Dichanthelium laxiflorum</i> | Open-flower rosette grass |
| Poales | Poaceae | <i>Dichanthelium scabriusculum</i> | Tall swamp witch grass |
| Poales | Poaceae | <i>Dichanthelium scoparium</i> | Velvety panic grass |
| Poales | Poaceae | <i>Imperata cylindrica</i> † | Cogon grass |
| Poales | Poaceae | <i>Kelochloa verrucosa</i> | Warty panic grass |
| Poales | Poaceae | <i>Panicum repens</i> † | Torpedo grass |
| Poales | Poaceae | <i>Paspalum urvillei</i> † | Vasey's grass |
| Poales | Poaceae | <i>Sacciolepis striata</i> | American cupscale |
| Poales | Poaceae | <i>Schizachyrium scoparium</i> | Common little bluestem |
| Saxifragales | Penthoraceae | <i>Penthorum sedoides</i> | Ditch stonecrop |
| Vitales | Vitaceae | <i>Muscadinia rotundifolia</i> | Muscadine |
| Rosales | Rosaceae | <i>Rubus pensilvanicus</i> | Pennsylvania blackberry |
| Rosales | Rosaceae | <i>Rubus trivialis</i> | Southern dewberry |
| Rosales | Urticaceae | <i>Boehmeria cylindrica</i> | Small-spike false nettle |
| Fagales | Fagaceae | <i>Quercus nigra</i> | Water oak |
| Fagales | Myricaceae | <i>Morella cerifera</i> | Wax myrtle |
| Magpighiales | Hypericaceae | <i>Hypericum hypericoides</i> | St. Andrew's Cross |
| Magpighiales | Euphorbiaceae | <i>Acalypha gracilens</i> | Short-stalk copperleaf |
| Magpighiales | Euphorbiaceae | <i>Triadica sebifera</i> † | Chinese tallow tree |
| Magpighiales | Phyllanthaceae | <i>Emblica urinaria</i> † | Pee flower, chamber bitter |
| Myrtales | Onagraceae | <i>Ludwigia octovalvis</i> | Mexican primrose willow |
| Sapindales | Sapindaceae | <i>Acer rubrum</i> | Red maple |
| Caryophyllales | Polygonaceae | <i>Persicaria punctate</i> | Dotted smartweed |
| Caryophyllales | Caryophyllaceae | <i>Drymaria cordata</i> † | West Indian chickweed |
| Caryophyllales | Amaranthaceae | <i>Alternanthera sessilis</i> † | Sessile joyweed |
| Cornales | Nyssaceae | <i>Nyssa biflora</i> | Swamp tupelo |
| Ericales | Symplocaceae | <i>Symplocos tinctoria</i> | Sweetleaf |
| Ericales | Cyrtillaceae | <i>Cyrtilla racemiflora</i> | Swamp titi |
| Ericales | Ericaceae | <i>Vaccinium elliotii</i> | Elliot's blueberry |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

| | | | |
|--------------|----------------|---------------------------------|----------------------|
| Gentianales | Rubiaceae | <i>Mitchella repens</i> | Partridge berry |
| Gentianales | Gelsemiaceae | <i>Gelsemium sempervirens</i> | Yellow Jessamine |
| Lamiales | Oleaceae | <i>Ligustrum sinense</i> † | Chinese privet |
| Lamiales | Lamiaceae | <i>Callicarpa americana</i> | American beautyberry |
| Lamiales | Lamiaceae | <i>Cantinoa mutabilis</i> † | Tropical bushmint |
| Aquifoliales | Aquifoliaceae | <i>Ilex vomitoria</i> | Yaupon |
| Asterales | Asteraceae | <i>Baccharis halimifolia</i> | Groundsel bush |
| Asterales | Asteraceae | <i>Bidens alba</i> † | Romerillo |
| Asterales | Asteraceae | <i>Conoclinium coelestinum</i> | Blue mistflower |
| Asterales | Asteraceae | <i>Erigeron pusillus</i> | Southern horseweed |
| Asterales | Asteraceae | <i>Eupatorium capillifolium</i> | Common dog fennel |
| Asterales | Asteraceae | <i>Mikania scandens</i> | Climbing hempvine |
| Asterales | Asteraceae | <i>Pluchea camphorata</i> | Common camphorweed |
| Asterales | Asteraceae | <i>Solidago altissima</i> | Tall goldenrod |
| Asterales | Asteraceae | <i>Solidago gigantea</i> | Giant goldenrod |
| Dipsacales | Viburnaceae | <i>Sambucus canadensis</i> | Common elderberry |
| Dipsacales | Caprifoliaceae | <i>Lonicera japonica</i> † | Japanese honeysuckle |

Transect MB4 - Plant Species List († = non-native)

| Order | Family | Species Name | Common Name |
|--------------|-----------------|---------------------------------|-------------------------------|
| Schizaeles | Lygodiaceae | <i>Lygodium japonicum</i> † | Japanese climbing fern |
| Polypodiales | Dennstaeciaceae | <i>Pteridium pseudocaudatum</i> | Southern braken |
| Polypodiales | Blechnaceae | <i>Lorinseria areolata</i> | Netted chain fern |
| Pinales | Pinaceae | <i>Pinus taeda</i> | Loblolly pine |
| Pinales | Cupressaceae | <i>Chamaecyparis thyoides</i> | Atlantic white cedar |
| Magnoliales | Magnoliaceae | <i>Magnolia grandiflora</i> | Southern magnolia |
| Laurales | Lauraceae | <i>Camphora officinarum</i> † | Camphor tree |
| Liliales | Smilacaceae | <i>Smilax auriculata</i> | Dune greenbrier |
| Liliales | Smilacaceae | <i>Smilax bona-nox</i> | Saw greenbrier |
| Liliales | Smilacaceae | <i>Smilax glauca</i> | White-leaf greenbrier |
| Liliales | Smilacaceae | <i>Smilax pumila</i> | Sarsaparilla vine |
| Liliales | Smilacaceae | <i>Smilax smallii</i> | Jackson vine |
| Arecales | Arecaceae | <i>Serenoa repens</i> | Saw palmetto |
| Poales | Juncaceae | <i>Juncus effusus</i> | Soft rush |
| Poales | Cyperaceae | <i>Carex longii</i> | Long's sedge |
| Poales | Cyperaceae | <i>Cyperus haspan</i> | Sheathed flatsedge |
| Poales | Cyperaceae | <i>Scirpus cyperinus</i> | Wooly bulrush |
| Poales | Poaceae | <i>Coleataenia rigidula</i> | Redtop panic grass |
| Poales | Poaceae | <i>Imperata cylindrica</i> † | Cogon grass |
| Poales | Poaceae | <i>Kelochloa verrucosa</i> | Warty panic grass |
| Poales | Poaceae | <i>Panicum repens</i> † | Torpedo grass |
| Poales | Poaceae | <i>Paspalum urvillei</i> † | Vasey's grass |
| Poales | Poaceae | <i>Sacciolepis striata</i> | American cupscale |
| Vitales | Vitaceae | <i>Muscadinia rotundifolia</i> | Muscadine |
| Fabales | Fabaceae | <i>Grona trifloral</i> † | Three-flowered beggerr's lice |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

| | | | |
|----------------|------------------|---------------------------------|-------------------------------|
| Rosales | Rosaceae | <i>Prunus serotina</i> | Black Cherry |
| Rosales | Rosaceae | <i>Rubus flagellaris</i> | Common dewberry |
| Rosales | Rosaceae | <i>Rubus pensilvanicus</i> | Pennsylvania blackberry |
| Rosales | Rosaceae | <i>Rubus trivialis</i> | Southern dewberry |
| Rosales | Moraceae | <i>Morus alba</i> † | White mulberry |
| Fagales | Fagaceae | <i>Quercus nigra</i> | Water oak |
| Fagales | Myricaceae | <i>Morella cerifera</i> | Wax myrtle |
| Magpighiales | Hypericaceae | <i>Hypericum hypericoides</i> | St. Andrew's Cross |
| Magpighiales | Hypericaceae | <i>Hypericum mutilum</i> | St. John's wort |
| Magpighiales | Euphorbiaceae | <i>Acalypha gracilens</i> | Short-stalk copperleaf |
| Magpighiales | Euphorbiaceae | <i>Triadica sebifera</i> † | Chinese tallow tree |
| Magpighiales | Phyllanthaceae | <i>Embluca urinaria</i> † | Pee flower, chamber bitter |
| Sapindales | Anacardiaceae | <i>Toxicodendron radicans</i> | Eastern poison ivy |
| Sapindales | Sapindaceae | <i>Acer rubrum</i> | Red maple |
| Malvales | Malvaceae | <i>Melochia corchorifolia</i> † | Chocolate weed |
| Caryophyllales | Polygonaceae | <i>Persicaria punctate</i> | Dotted smartweed |
| Caryophyllales | Caryophyllaceae | <i>Drymaria cordata</i> † | West Indian chickweed |
| Cornales | Nyssaceae | <i>Nyssa biflora</i> | Swamp tupelo |
| Ericales | Symplocaceae | <i>Symplocos tinctoria</i> | Sweetleaf |
| Ericales | Cyrillaceae | <i>Cyrilla racemiflora</i> | Swamp titi |
| Ericales | Ericaceae | <i>Leucothoe axillaris</i> | Coastal dog hobble |
| Ericales | Ericaceae | <i>Rhododendron simsii</i> † | Indian azalea |
| Ericales | Ericaceae | <i>Vaccinium arboreum</i> | Sparkleberry |
| Ericales | Ericaceae | <i>Vaccinium elliotii</i> | Elliot's blueberry |
| Gentianales | Rubiaceae | <i>Hexasepalum teres</i> | Poor Joe |
| Gentianales | Rubiaceae | <i>Mitchella repens</i> | Partridge berry |
| Gentianales | Rubiaceae | <i>Richardia humistrata</i> | South American Mexican clover |
| Gentianales | Gelsemiaceae | <i>Gelsemium sempervirens</i> | Yellow Jessamine |
| Solanales | Convolvulaceae | <i>Dichondra caroliniensis</i> | Carolina pony's foot |
| Lamiales | Oleaceae | <i>Ligustrum sinense</i> † | Chinese privet |
| Lamiales | Tetrachondraceae | <i>Polypremum procumbens</i> | Rust weed |
| Lamiales | Plantaginaceae | <i>Scoparia dulcis</i> | Licorice weed |
| Lamiales | Linderniaceae | <i>Micranthemum umbrosum</i> | Shade mud flower |
| Lamiales | Bignoniaceae | <i>Bignonia capreolata</i> | Crossvine |
| Lamiales | Lamiaceae | <i>Callicarpa americana</i> | American beautyberry |
| Lamiales | Lamiaceae | <i>Lycopus angustifolius</i> | Narrowleaf bugleweed |
| Aquifoliales | Aquifoliaceae | <i>Ilex coriacea</i> | Big gallberry |
| Aquifoliales | Aquifoliaceae | <i>Ilex vomitoria</i> | Yaupon |
| Asterales | Campanulaceae | <i>Lobelia rogersii</i> | McVaugh's Lobelia |
| Asterales | Asteraceae | <i>Ambrosia artemisiifolia</i> | Annual ragweed |
| Asterales | Asteraceae | <i>Bidens alba</i> † | Romerillo |
| Asterales | Asteraceae | <i>Bidens mitis</i> | Coastal plain tickseed |
| Asterales | Asteraceae | <i>Conoclinium coelestinum</i> | Blue mistflower |
| Asterales | Asteraceae | <i>Erigeron pusillus</i> | Southern horseweed |
| Asterales | Asteraceae | <i>Eupatorium capillifolium</i> | Common dog fennel |

**MAGNOLIA BLUFFS PRE-RESTORATION STREAM ASSESSMENT
LOWER FISH RIVER WATERSHED**

| | | | |
|------------|----------------|------------------------------|----------------------|
| Asterales | Asteraceae | <i>Helianthus floridanus</i> | Florida sunflower |
| Asterales | Asteraceae | <i>Mikania scandens</i> | Climbing hempvine |
| Asterales | Asteraceae | <i>Pityopsis nervosa</i> | Common silkgrass |
| Asterales | Asteraceae | <i>Solidago altissima</i> | Tall goldenrod |
| Asterales | Asteraceae | <i>Youngia japonica</i> † | Asiatic hawk's beard |
| Dipsacales | Viburnaceae | <i>Sambucus canadensis</i> | Common elderberry |
| Dipsacales | Viburnaceae | <i>Viburnum nudum</i> | Southern wild raisin |
| Dipsacales | Caprifoliaceae | <i>Lonicera japonica</i> † | Japanese honeysuckle |