



LAKE FAYETTEVILLE WATER QUALITY STUDY

Environmental Action Committee

September 18, 2023

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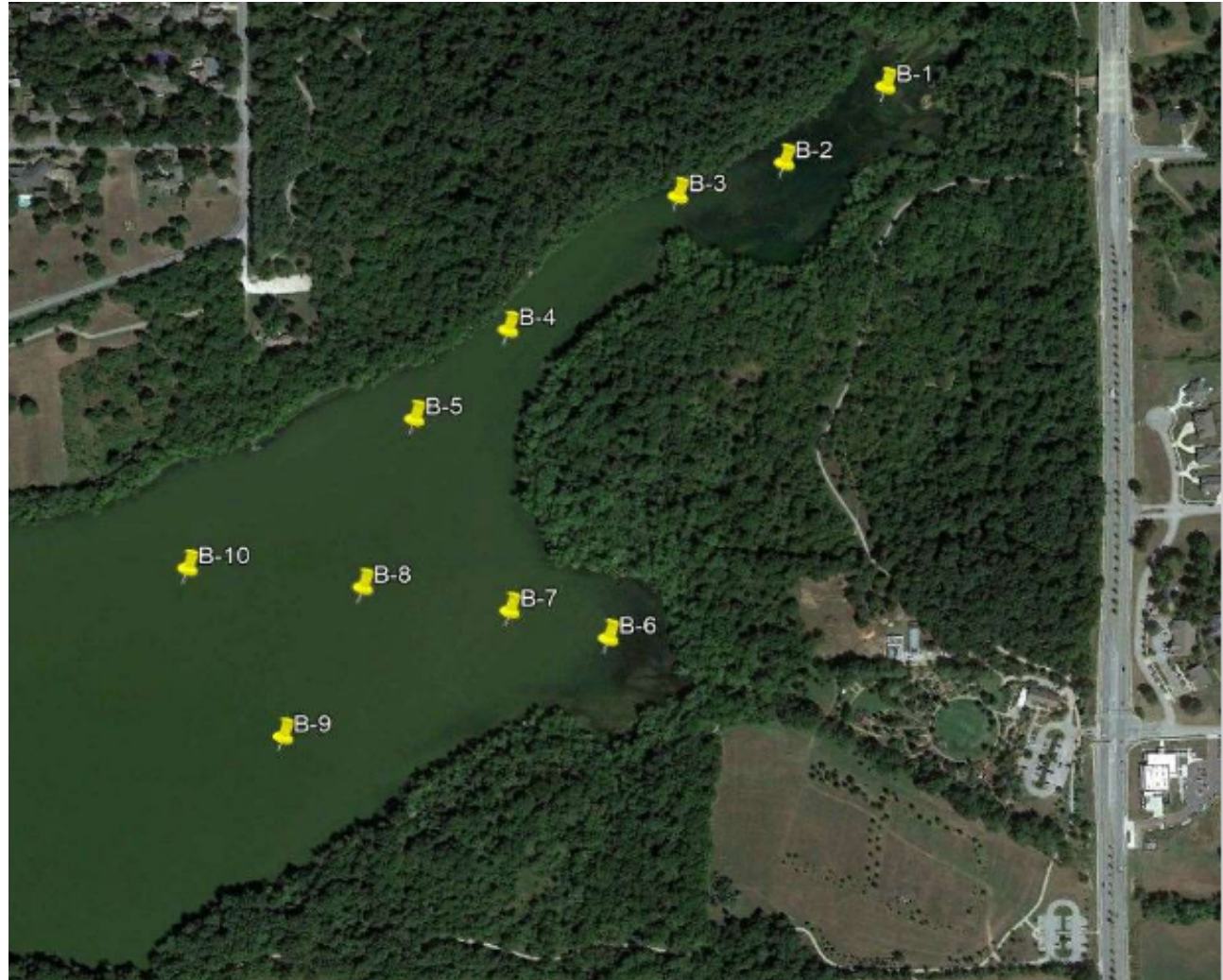
CITY OF
FAYETTEVILLE
ARKANSAS



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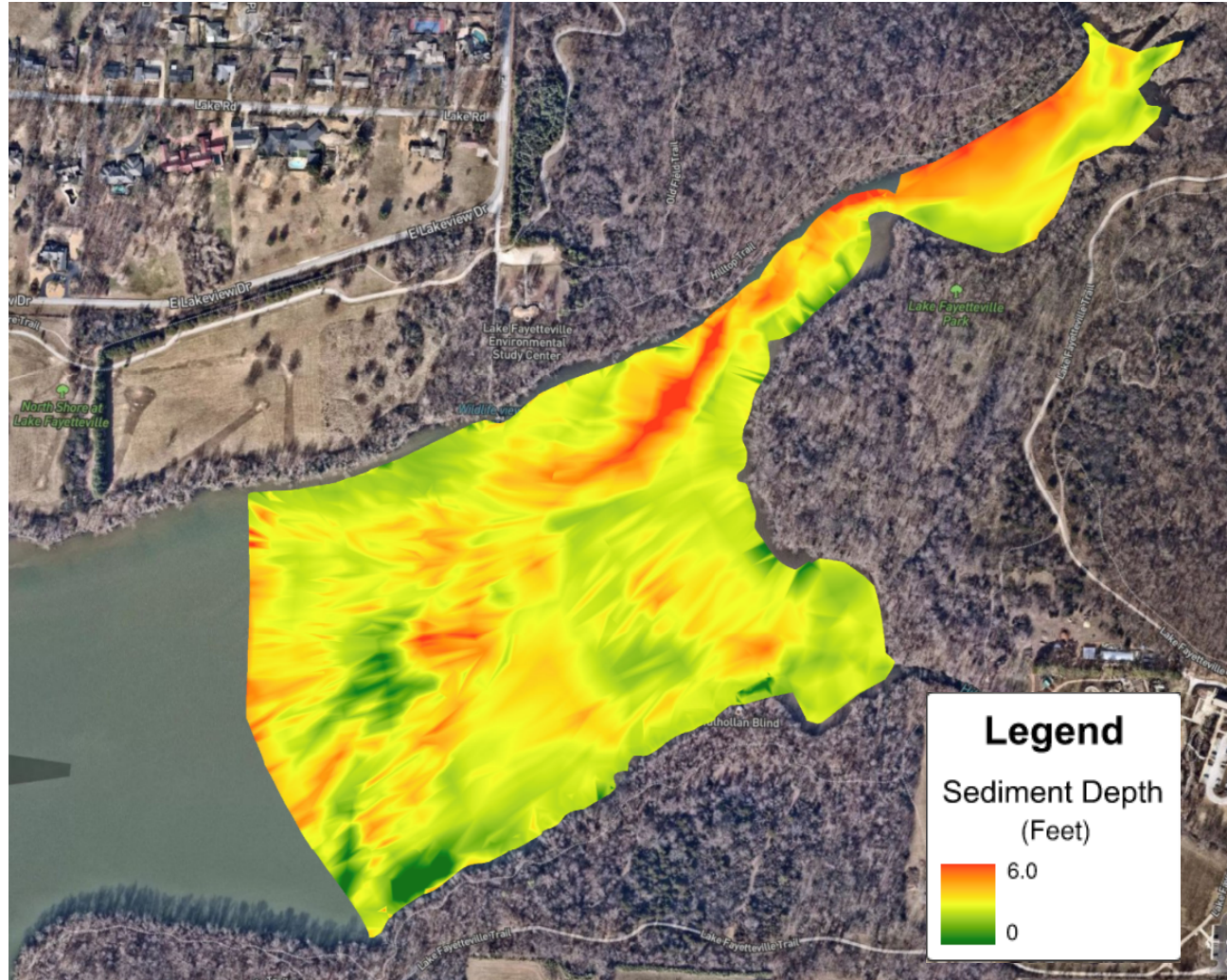
Field Data Collection

- Bathymetric Survey
- Water Samples
- Sediment Samples
- Vegetation Survey



Field Data Assessment

- Bathymetric Mapping
- Vegetation Classification



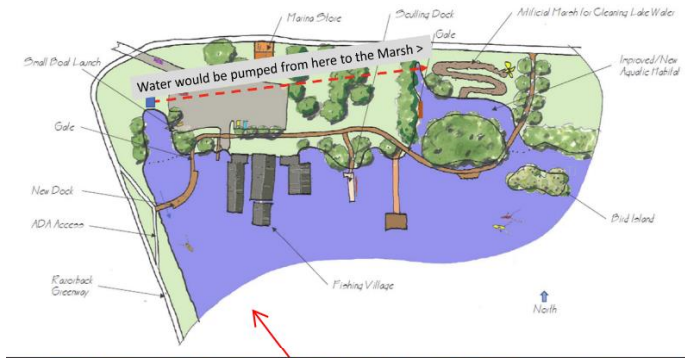
Data Analysis

- Water Chemical Analysis
- Soil Chemical Analysis
- Soil Classification
- Estimated Pollutant Load



Potential In-Lake Solutions

SHORT TERM



In-Lake Solutions

SHORT TERM 3-5 YEARS

1. Lake Alum Treatments
2. Aeration
3. Biochar Bags
4. Sediment Forebay
5. Wetland and Channel Concept
6. Created Wetland Concept Near Marina

GOAL: Chemical application to precipitate soluble phosphorus in the water column and blanket lake bottom sediments, temporarily preventing phosphorus release back into the water column.

- Rapid water quality improvement
- Relatively inexpensive
- Temporary solution (5-12 years)



Photo from: www.capitolregionwd.org

In-Lake Solutions

SHORT TERM 3-5 YEARS

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GOAL: Whole lake solution to increase dissolved oxygen in the lake bottom and sediment to allow natural biologic processes to reduce in-lake nutrient loads and cause aerobic digestion of sediment.

- Addresses root cause of nutrient recycling
- Power must be supplied to run compressors
- A network of weighted hoses and diffusers needed
- Requires ongoing operation and maintenance



www.texaslakeandpondsupplies.com

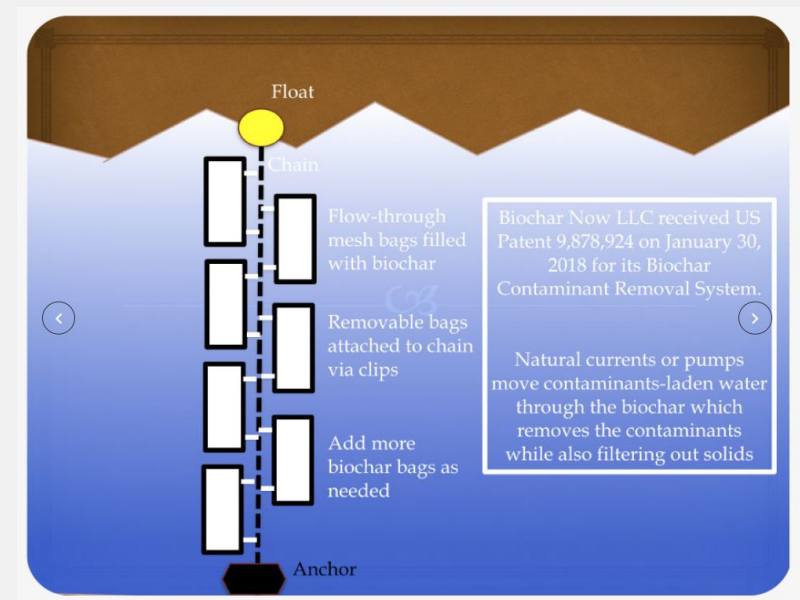
In-Lake Solutions

SHORT TERM 3-5 YEARS

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GOAL: Localized solution to capture and remove soluble phosphorus in the water column.

- Localized benefit
- Low-cost solution
- Regular monitoring and maintenance needed



www.biocharnow.com

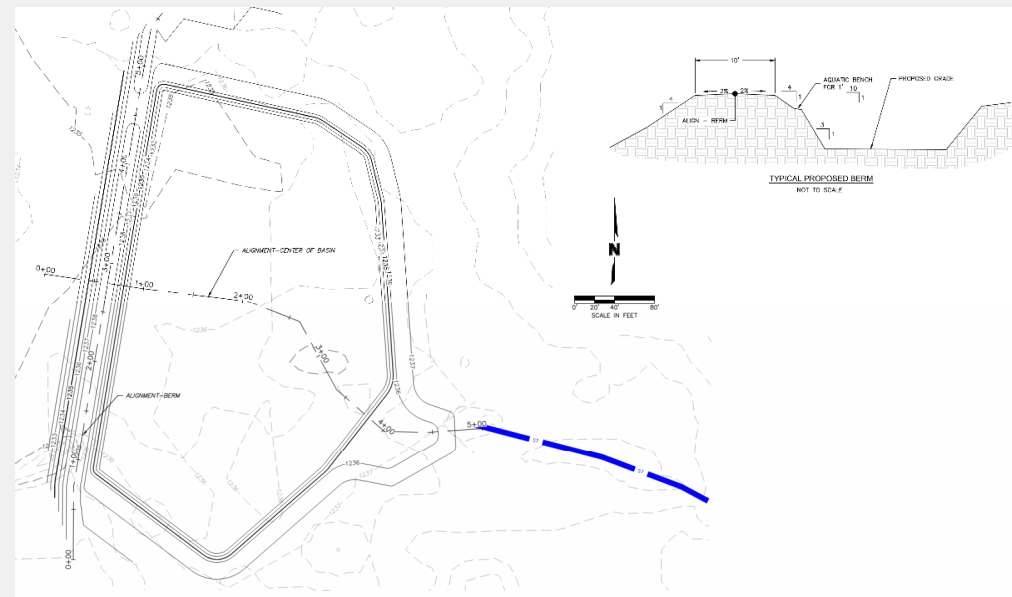
In-Lake Solutions

SHORT TERM 3-5 YEARS

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GOAL: Sediment and nutrient capture from 1,040-acre Hilton Branch watershed.

- Reduces incoming sediment and nutrient loads
- Long range benefit
- Minimal ongoing maintenance needed



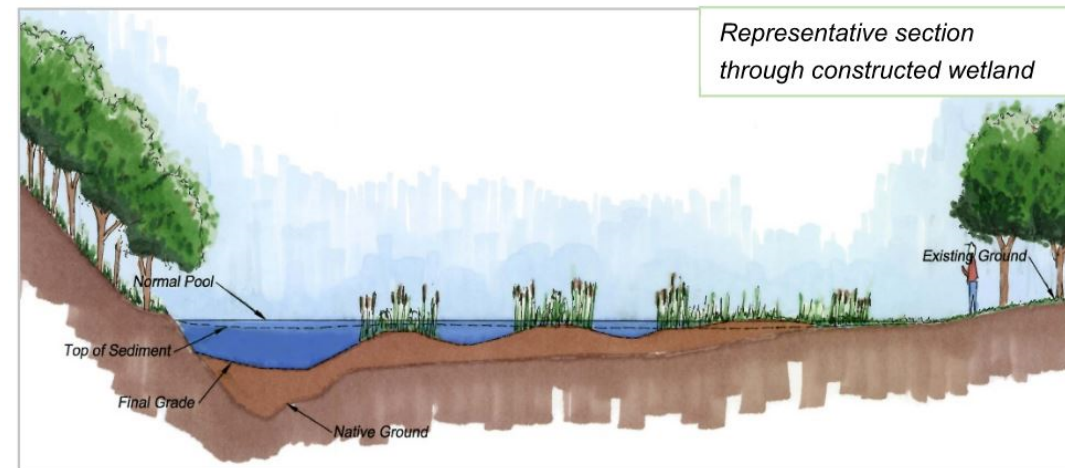
In-Lake Solutions

SHORT TERM 3-5 YEARS

1. Lake Alum Treatments
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3. Biochar Bags
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- 5. Wetland and Channel Concept**
6. Created Wetland Concept Near Marina

GOAL: Sediment diversion and nutrient uptake from 5,000-acre Clear Creek watershed.

- Reduces incoming sediment and nutrient loads
- Long range benefit
- Minimal ongoing maintenance needed
- Excavated sediment piled up on-site
- Ecosystem benefits



In-Lake Solutions

SHORT TERM 3-5 YEARS

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GOAL: Local aesthetic, educational, and water quality improvements around the marina.

- Localized water quality benefit
- Educational opportunity
- Habitat benefit

Lake Fayetteville Dock Replacement Concept Sketch
Park Planning - December 17, 2019

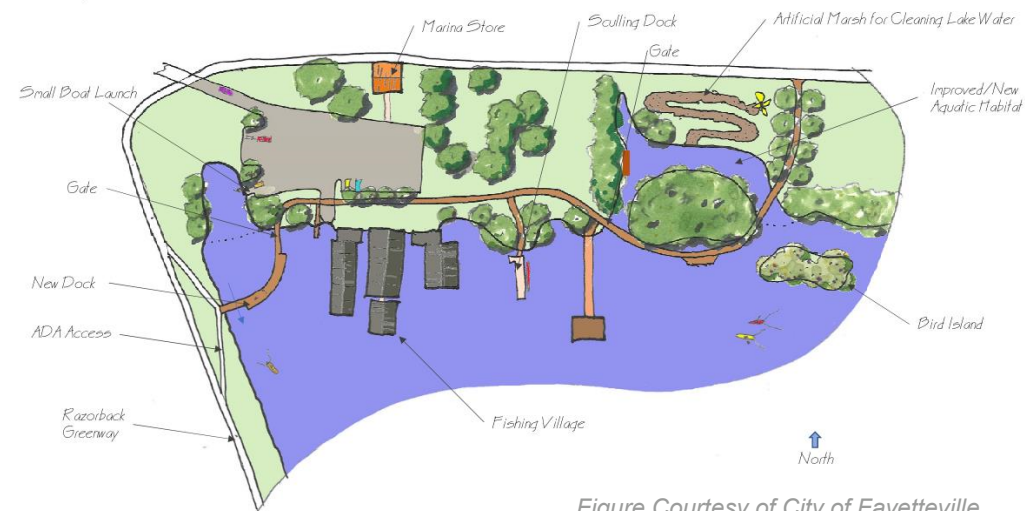
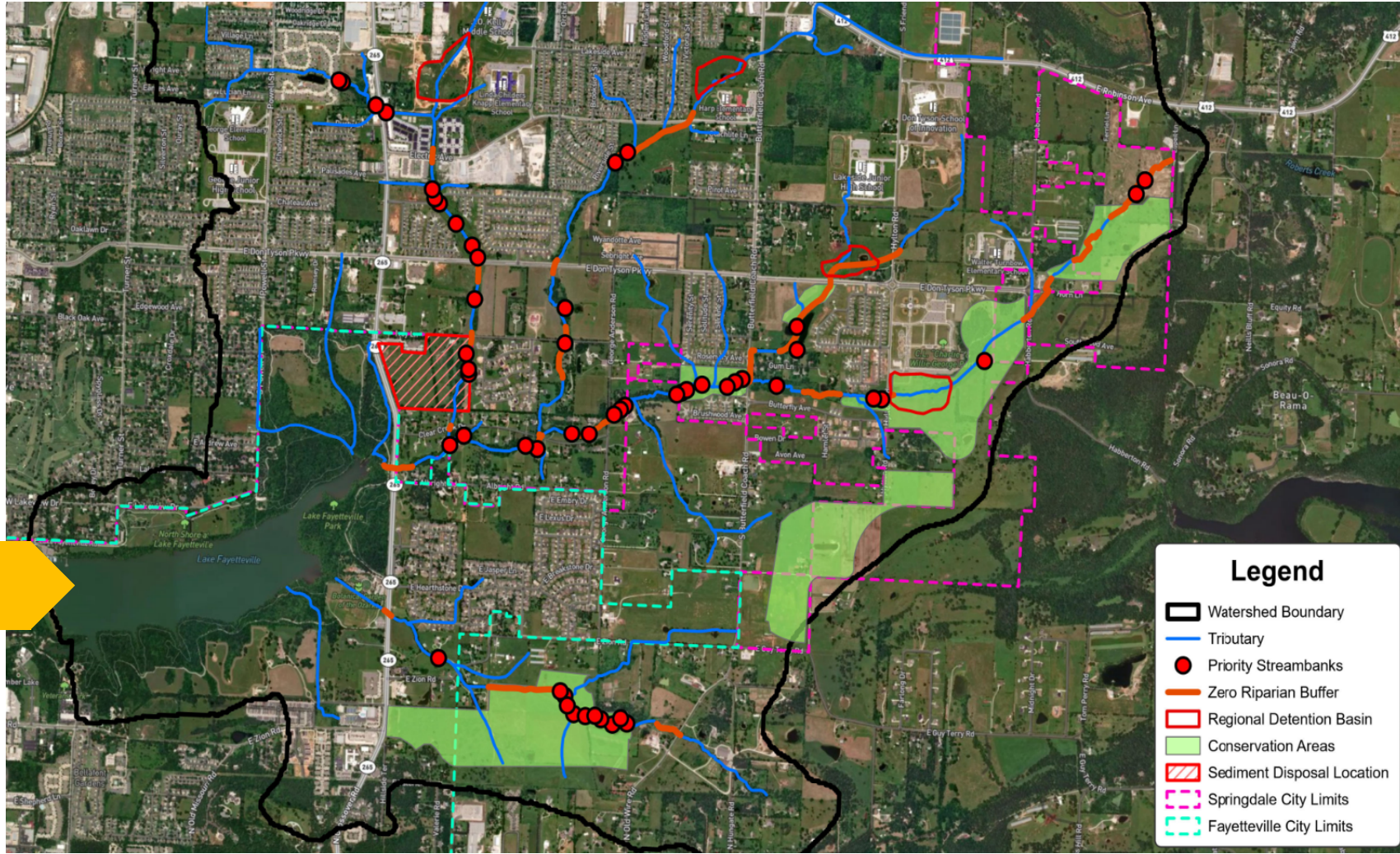


Figure Courtesy of City of Fayetteville

Potential Watershed Solutions

LONG TERM



Watershed Solutions

LONG TERM 10+ YEARS

1. WATERSHED IMPROVEMENTS

- Streambank Stabilization
- Conservation Areas
- Regional Detention
- Riparian Corridor Restoration
- Green Infrastructure

2. SEDIMENT REMOVAL

- Hydraulic Dredging
- Mechanical Excavation

3. WATERSHED PROGRAMMATIC BMPS

- Lawn Care
- Pet Waste Disposal
- Low Impact Development
- Native Vegetation



Short –Term Solution Prioritization Matrix

1. CRITERIA

- Initial Cost
- Annual Cost
- Immediate Water Quality Benefit
- Long-Term Water Quality Benefit
- Stand-Alone Solution

2. RESULTS

- Range 1.7 to 3.4 out of 5
- Highest Priority Single Solution: Aeration (3.4)
- Note: Aeration is a tie with combined solution of a lake alum treatment, the sediment forebay, and the wetland and channel at Clear Creek.

Short Term Solution	Initial Cost	Annual Cost	Immediate Water Quality Benefit	Long Term Water Quality Benefit	Stand Alone Solution	Weighted Prioritization Value
Prioritization Criteria Weighting (Percent)	20	20	25	25	10	--
Wetland and Channel at Clear Creek	1	2	4	4	4	3.0
Sediment Forebay	3	3	3	3	2	2.9
Aeration	1	1	5	5	5	3.4
Lake Alum Treatment	3	3	5	2	2	3.2
Biochar Treatment	5	5	1	1	1	2.6
Marina Water Quality Improvements	2	4	2	2	1	2.3
Mechanical Sediment Excavation	1	3	2	1	1	1.7
Alum Treatment, Sediment Forebay, & Wetland and Channel at Clear Creek	1	1	5	5	5	3.4
Prioritization Scale	5 = Low 4 = Medium Low 3 = Medium 2 = Medium High 1 = High		1 = Low 2 = Medium Low 3 = Medium 4 = Medium High 5 = High			--

Short –Term Solution Cost Comparison

1. COST SUMMARY

- Initial construction cost
- Annual operation and maintenance cost in 5-year increments for 15 years.

2. DISCUSSION

- Annual worth over the full 15-year period helps frame the full cost of each solution.
- One item not considered in the prioritization matrix is long-term maintenance responsibility for city staff.
 - Aeration and the marina improvements would require ongoing city maintenance for pumps, distribution lines, etc.
 - The wetland and channel solution would require annual vegetation management and periodic sediment removal.
 - The biochar solution would require annual material replacement.

Short Term Solution	Initial Cost	Year 1 - 5 Total Cost	Year 6-10 Total Cost	Year 11-15 Total Cost	Annual Worth
Wetland and Channel	\$1,684,800	\$50,000	\$160,000	\$50,000	\$179,490
Sediment Forebay	\$1,034,784	\$0	\$250,000	\$0	\$114,480
Aeration	\$1,576,800	\$825,000	\$250,000	\$250,000	\$249,880
Alum Treatment	\$362,400	\$0	\$471,120	\$0	\$62,779
Biochar Treatment	\$76,800	\$100,000	\$100,000	\$100,000	\$27,399
Mechanical Excavation	\$6,710,400	\$0	\$10,736,640	\$0	\$1,281,523
Marina	\$2,125,000	\$125,000	\$125,000	\$125,000	\$240,856
Alum Treatment, Sediment Basin, & Clear Creek Wetland	\$3,081,984	\$50,000	\$881,120	\$50,000	\$356,750

QUESTIONS



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