Benthic Macroinvertebrate Stream Health Mapping Study

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MacroInvertebrates ARE ALL AROUND US!

Typically this is true!
There are hundreds of little insects and larvae that roam just beneath your feet in stream beds. These little guys help us determine the quality of stream health and maintain a functioning ecosystem.

What's The Point?

It's super simple!
By collecting and observing BMI organisms, we can determine a stream's health based on a few factors,

1. Stream Order
    a. Determines density and area of BMI found
2. Classification Grading
    a. Each BMI belongs to a specific class, typically there are 3 distinguishable classes
    b. Class 1 identifying as most sensitive, Class 3 most susceptible to pollution
3. PH Quality
    a. Verifies classification, ability to determine polluted water levels not seen by naked eye

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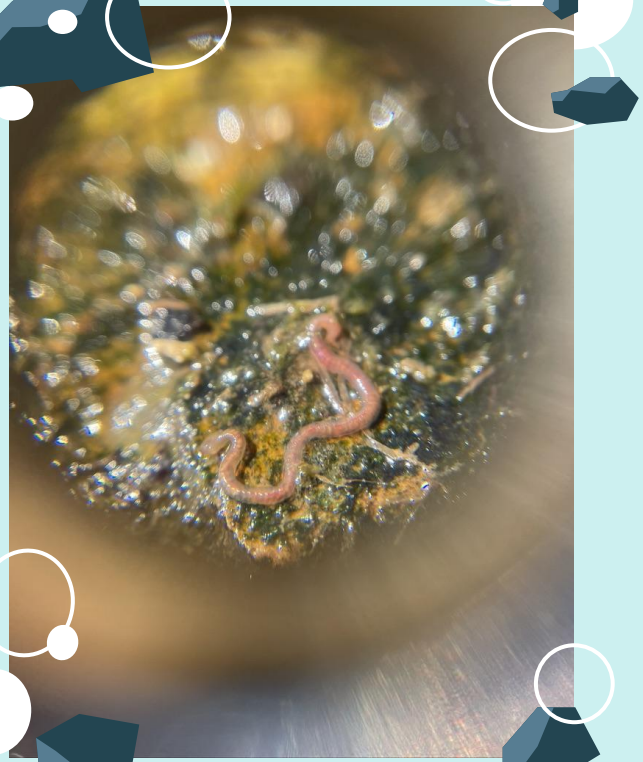
01

About BMI's

Benthic MacroInvertebrates: What Are They?

Benthic MacroInvertebrates, better known as ‘bottom-dwellers’, are small insects mostly in the beginning larvae stages of their long lives. These backbone lacking species are normally aquatic and found near waters during most of their lives. They are most commonly found hiding in vegetation or on the underbelly of rocks, possibly burrowed within the streambed sediments.



Why Are They Important?

Determining Biological Conditions

Most BMI's spend the entirety of their lives in water. They are also easy to collect and determine difference in pollution tolerance. Limited mobility in BMI allows for us to determine what stressors they've integrated and how they respond due to the limited escape from pollution.

Let's Take A Look!

Caddisfly Larvae

Gilled Snail

Mayfly Nymph

Leech

Water Penny Larvae

StoneFly Nymph

Dobsonfly Larvae

Mayfly Larvae

BMI Classification Score

Each organism classification will determine a score based on the organism's tolerability towards the pollution in the water, if any.

1

Most Sensitive

These organisms will most likely be found in clear, clean waters with little pollution. This indicates healthy water!

2

Tolerable

Class 2 organisms are somewhat common and can tolerate mildly polluted waters. This indicates good water!

3

Tolerant

Tolerant organisms can live in most polluted waters. This doesn't indicate dirty water but shows that there is pollution.

02
Stream
Order

Stream Order: What Is It?

FUN FACT:
The largest river in the world, The Amazon, is a twelfth order waterway!

When two small streams meet, the smaller of streams becomes tributary to the other, creating a new order. A stream with no tributaries is considered a Level 1 stream. Levels 1-3 are considered headwater streams, or most common.

Here's how it gets a little complicated: stream order is not based on size! When two first order streams meet, a second order tributary is formed. To create a third order, you must have two second order tributaries that meet to make third order and so on.

WHOA..
So there are different levels of streams??
YES!

Basic Classifications

Classes 1-3

Headwater streams, most common in small streams.

Classes 4-6

Medium Streams, growth in stream width.

Classes 7+

River classification, ANY order larger than 7.

Why It's Beneficial!

By determining stream order, we can find a variety of different organisms. Each class of organisms will determine different pollution tolerability. Finding these tolerabilities allows us to determine which areas have been more susceptible towards pollution.

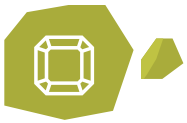
03
PH Levels

PH Level Outcomes

7.8

Little Osage Creek

Little organism variation, high quantity of Level 1 BMI



7.2

Osage Creek

Variety of BMI discovered, high quantity of level 2

6.8

Little Sugar Creek

Area was smelly, visible pollution, little variety of BMI, mostly Level 3

7

Clear Creek

High variety of BMI and wildlife, clear waters

7.5

Spring Creek

Smelly waters, murky, high quantity of Level 3

Clear Creek **shows a more contrasted shade of orangish red. Water is clear and has strong current.**

Little Sugar Creek **shows a lighter hue of orangish yellow. Water is murky and covered in vegetation.**

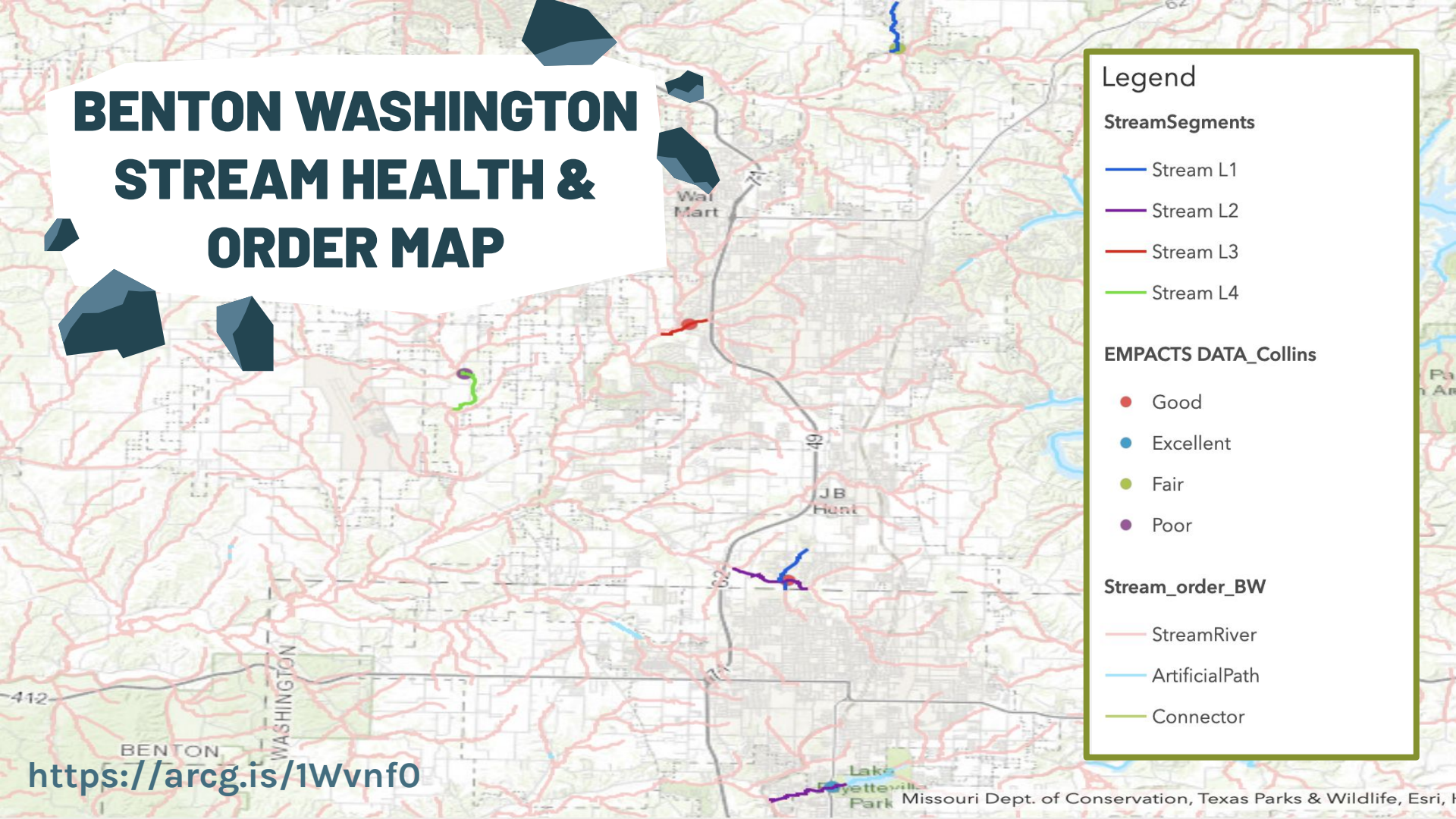
Let's See The Difference!

Clear Creek

Little Sugar Creek

04 Stream Health Map

BENTON WASHINGTON STREAM HEALTH & ORDER MAP



https://arcg.is/1Wvnf0

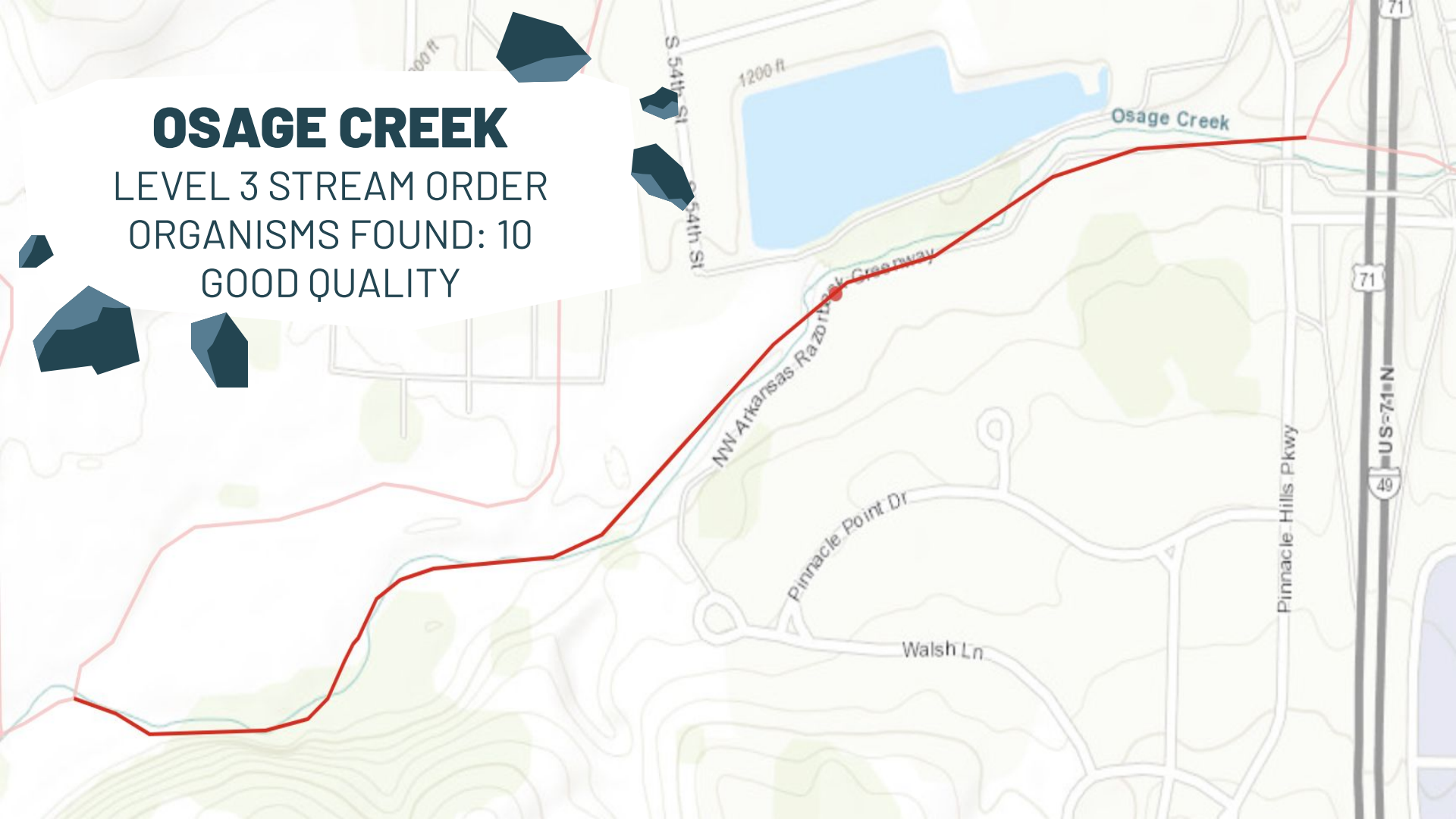
LITTLE SUGAR CREEK
LEVEL 1 STREAM ORDER
ORGANISMS FOUND: 8
FAIR QUALITY
Hallack Ln
Ryan Rd
94
Sugar Creek Rd

LITTLE OSAGE CREEK

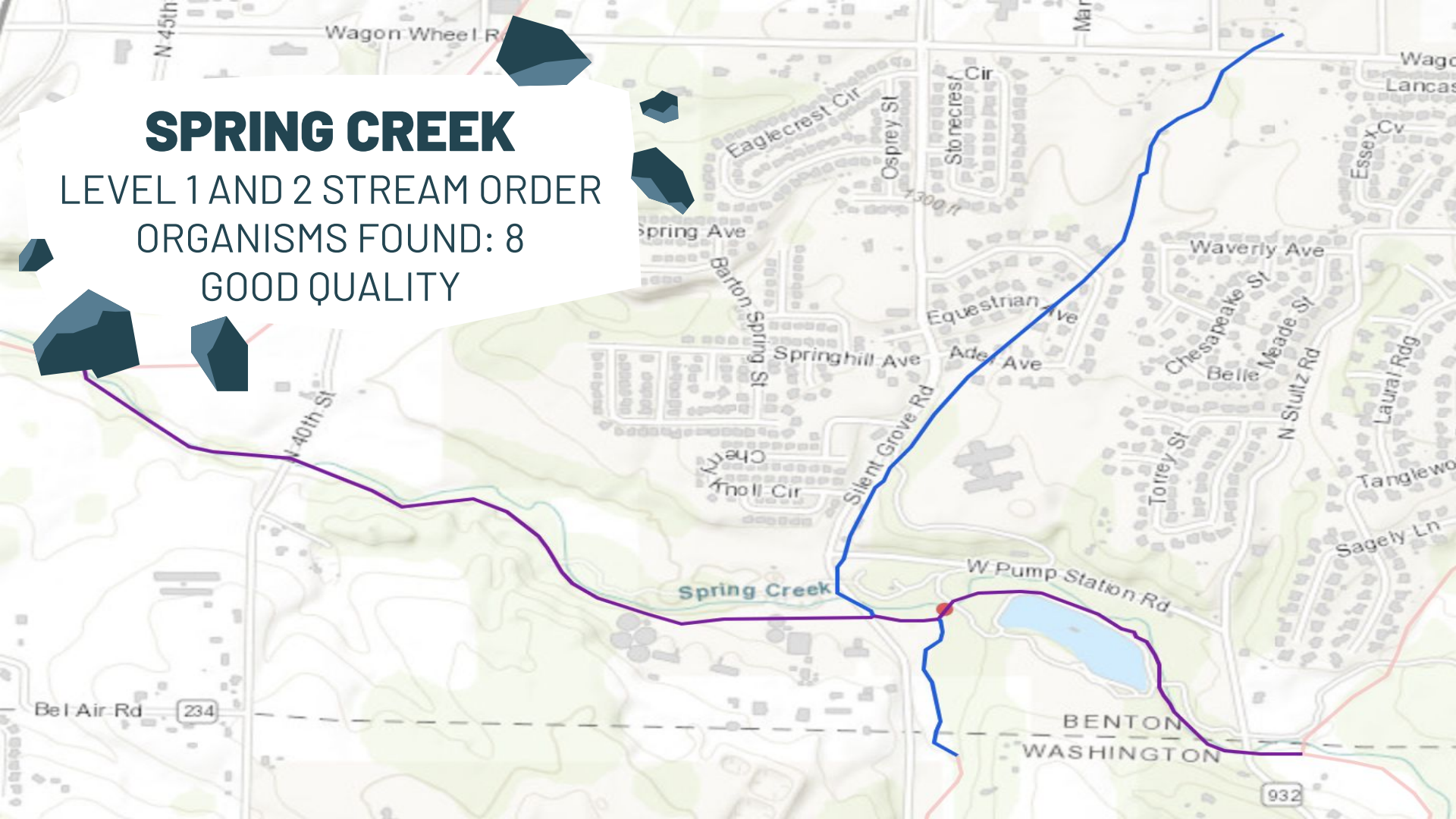
LEVEL 4 STREAM ORDER
ORGANISMS FOUND: 4
POOR QUALITY

OSAGE CREEK

LEVEL 3 STREAM ORDER
ORGANISMS FOUND: 10
GOOD QUALITY



CLEAR CREEK
LEVEL 1 STREAM ORDER
ORGANISMS FOUND: 11
EXCELLENT QUALITY
Clear Creek
Northwest Arkansas Mall
N College Ave
Lokomotion Family Fun Park
Waterside Ct
N Frontage Rd
E Shepherd Ln
S Wilkerson St
W Hendrix Dr
Arkansas and
Meadow View Dr


SPRING CREEK
LEVEL 1 AND 2 STREAM ORDER
ORGANISMS FOUND: 8
GOOD QUALITY
Wagon Wheel Rd
Eaglecrest Cir
Osprey St
Storecrest Cir
1300 ft
Spring Ave
Barton Spring St
Springhill Ave
Equestrian Ave
Waverly Ave
Chesapeake St
Belle Meade St
N Stultz Rd
Laural Rdg
Torrey St
Cherry Knoll Cir
Silent Grove Rd
W Pump Station Rd
Spring Creek
Sagely Ln
Bel Air Rd
234
BENTON
WASHINGTON
932

Timeline

OCT 1 - NOV 17

CONDUCTED RESEARCH, COLLECT DATA

NOV 18 - DEC 1

FILE CONVERSIONS, EXCEL DATA INPUT, DRIVE FOLDERS CREATED

DEC 2 - DEC 8

GIS MAP CREATED, DATA INPUT AND TRANSFER, MEETING WITH PROF PHILLIPS

DEC 9

PRESENTATION

COMMUNITY

- By generating a GIS map of multiple tested areas and providing supporting data of water quality research, I have provided the Corps of Engineers with evidence of positive water quality that they have requested.
- I have published my map online as a resource that can better inform the public about the water quality in these areas

CURRICULUM

1. Describe the geological factors affecting the use, supply, contamination, and treatment of surface and groundwater resource
2. Demonstrate the ability to utilize Global Positioning System and GIS Technology

ACKNOWLEDGMENTS/ CITATIONS

- Professor Lowrey, Course Instructor
- EMPACTS Lab Staff
- Professor Phillips, EMPACTS Facilitator
- https://www.wvca.us/envirothon/a7.cfm

APPENDIX AND REFERENCES

BENTONWASH-HEALTH&ORDER MAP
https://arcg.is/1Wvnf0

PERSONAL DATA PHOTO COLLECTION

PHOTO JOURNAL