

SPRING 2018

Comparison of

# WATER QUALITY

in the Springfield Mill Race

ADVANCED WATER QUALITY TEAM | SPRINGFIELD  
HIGH SCHOOL

## A BRIEF

# HISTORY

- 3.5-mile long stretch of water and a 40 acre Mill Pond.
- Inlet is on the Middle Fork of the Willamette, near Clear Water Park.
- Flowed 3 miles through agricultural areas in southern Springfield to the Millpond and then to Willamette River.
- In 1852, Elias Briggs hand-dug the Mill Race with the help of his son.
- Used to power gristmills and early agricultural industries.
- In 1985, a majority of the Mill Race was donated to the City of Springfield by the Georgia-Pacific Corporation.



*Top:* The Mill Race flowing through an early wooden culvert.

(Photo courtesy of the Springfield Museum)

*Bottom:* The Springfield Mill Race.

(Photo courtesy of the Springfield Museum)



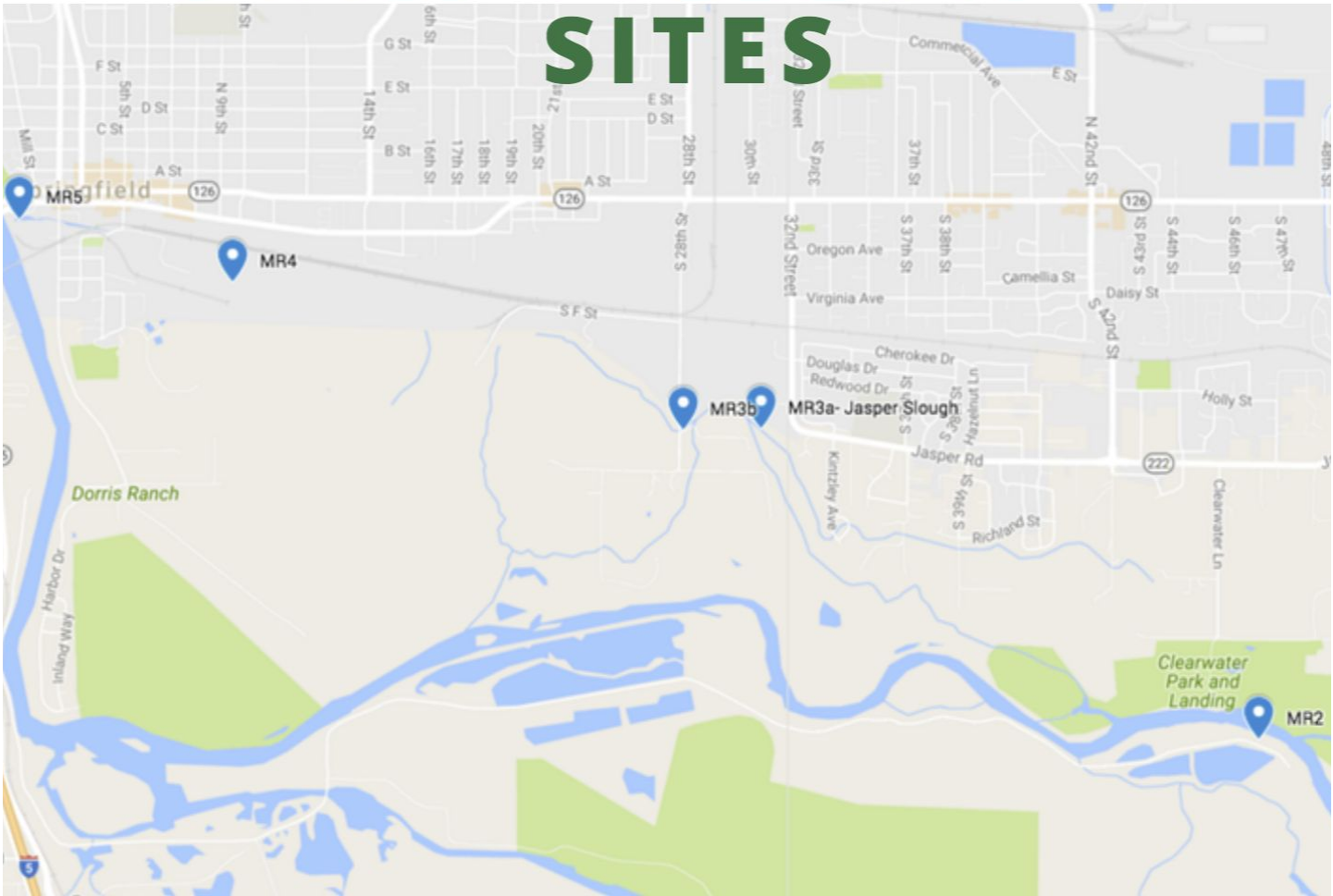
## CURRENT RESTORATION

# EFFORTS

- Has potential to be used for recreation and as a salmon bearing waterway.
- Phase One: City of Springfield changed the inlet at Clearwater Park
- Phase Two: removed mill pond and created a meandering stream channel and wetland
- 2015-2016, the city constructed the Mill Race Storm Water Facility



# DATA COLLECTION SITES



A photograph of a river or stream with trees and branches in the background and foreground. The water is calm and reflects the surrounding greenery. The text 'STUDY QUESTION' is overlaid in white, bold, uppercase letters, centered horizontally. A thin white horizontal line is positioned below the title.

# STUDY QUESTION

Has the water quality in the  
Springfield Mill Race changed  
over time?

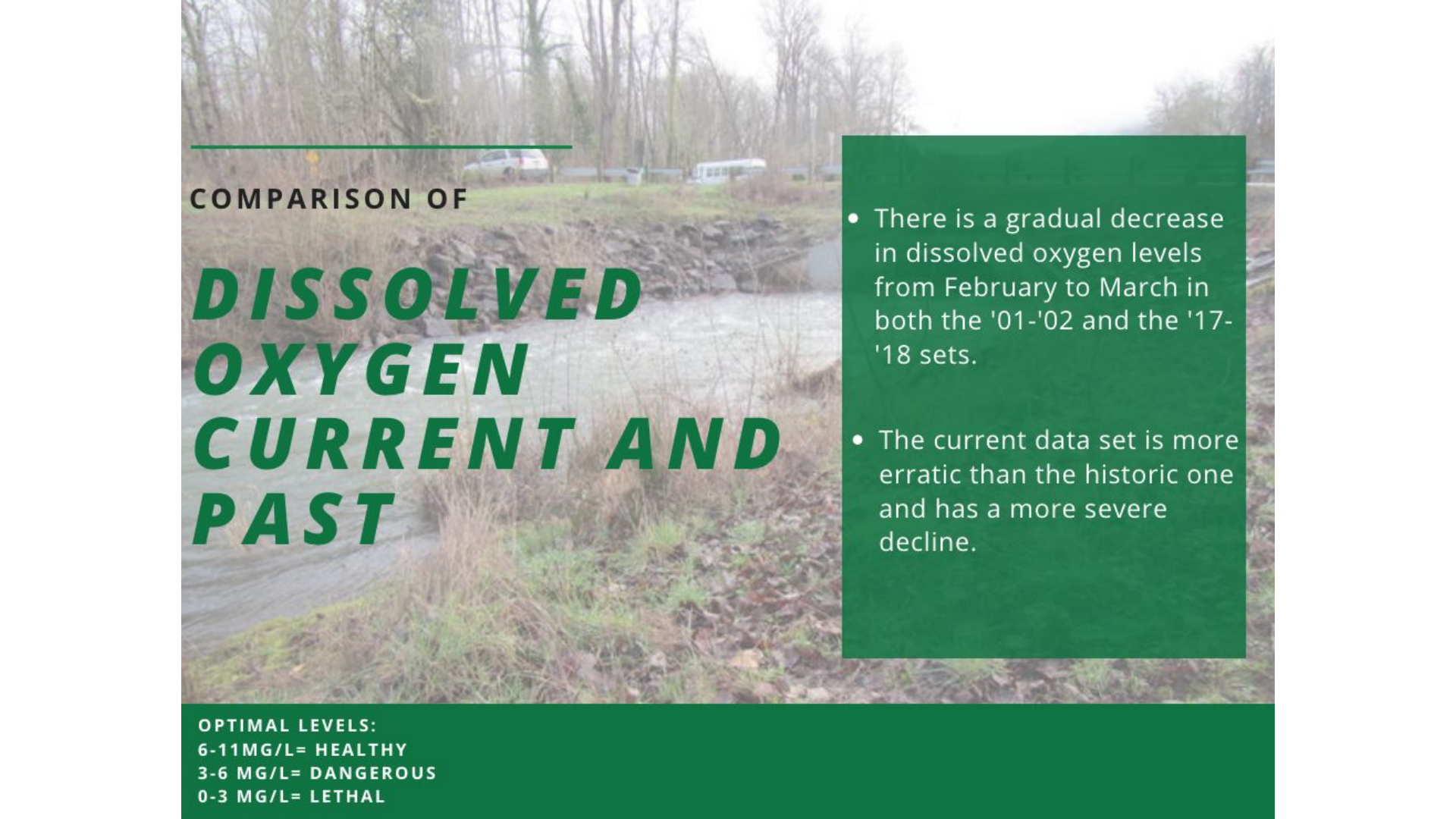


**DATA ANALYSIS:**

# WATER QUALITY PARAMETERS

- Dissolved Oxygen
- Water and Air Temperature
- Turbidity
- pH
- Conductivity
- Phosphates
- Nitrates
- Nitrites
- Ammonia
- E. Coli and Coliform bacteria





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COMPARISON OF

# ***DISSOLVED OXYGEN CURRENT AND PAST***

- There is a gradual decrease in dissolved oxygen levels from February to March in both the '01-'02 and the '17-'18 sets.
- The current data set is more erratic than the historic one and has a more severe decline.

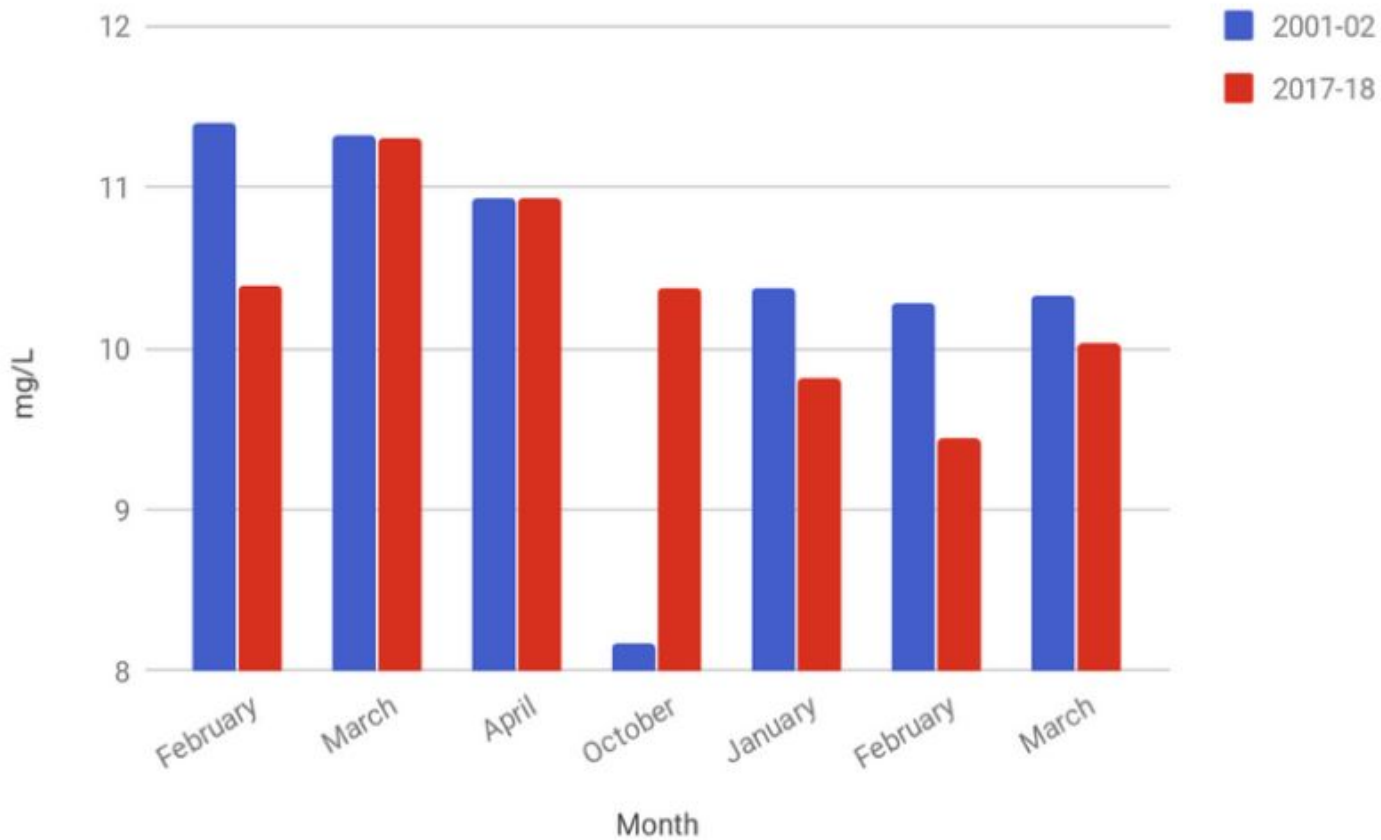
**OPTIMAL LEVELS:**

**6-11MG/L= HEALTHY**

**3-6 MG/L= DANGEROUS**

**0-3 MG/L= LETHAL**

# DISSOLVED OXYGEN CURRENT AND PAST COMPARISON





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## COMPARISON OF

# ***DISSOLVED OXYGEN BY SITE***

- Dissolved oxygen levels have decayed in all of the sites except for Site 2, where the millrace is closest to the headwaters of the Willamette River.
- Dissolved oxygen levels, on average, have decreased since the previous historic data was taken.

### OPTIMAL LEVELS:

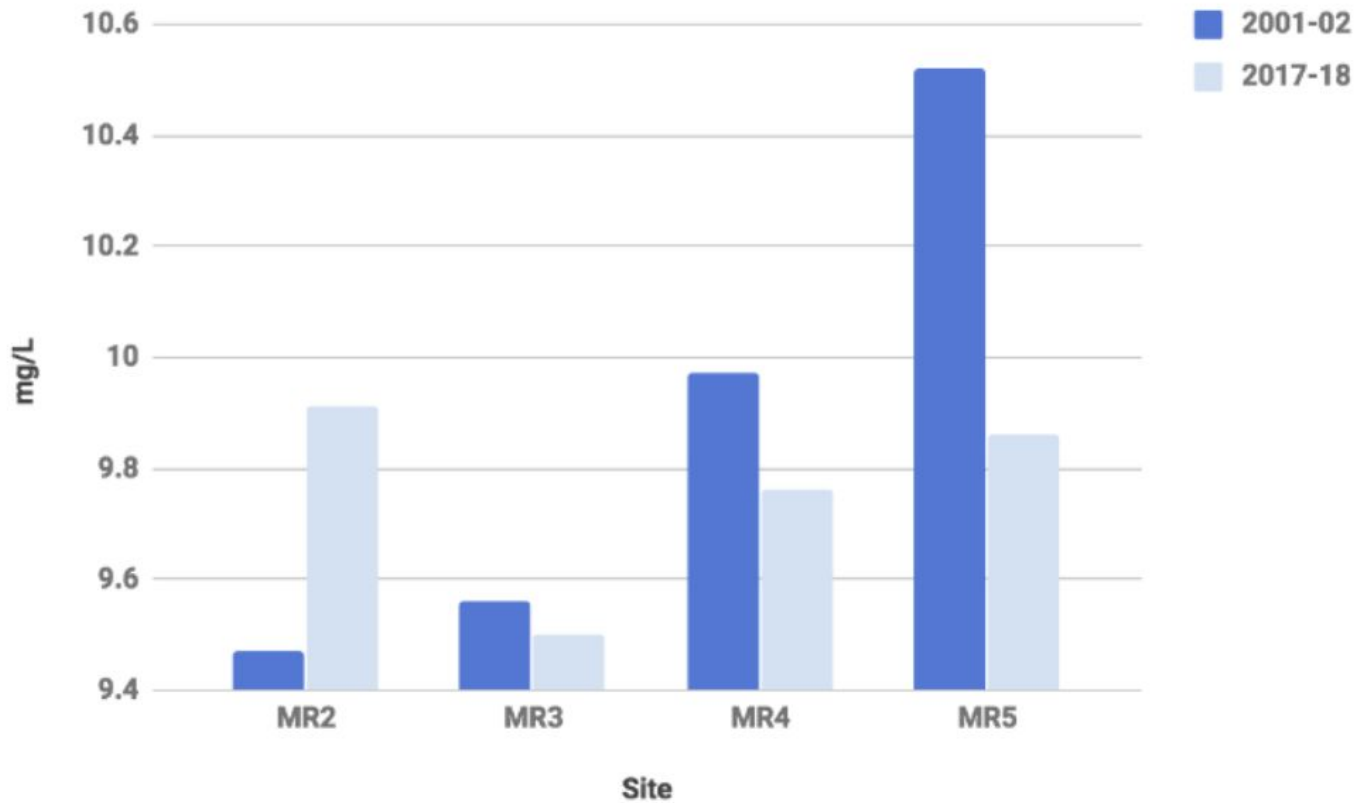
6-11MG/L= HEALTHY

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## DISSOLVED OXYGEN LEVELS BY SITE

# COMPARISON





COMPARISON OF

# ***WATER TEMPERATURE CURRENT AND PAST***

- Water temperature is the foundation of all work done on water
- Lower temperature holds more dissolved oxygen
- The average water temperature has lowered by a small percentage
- Although water temperature has fallen over time, the dissolved oxygen levels have also fallen.

**OPTIMAL LEVELS:**

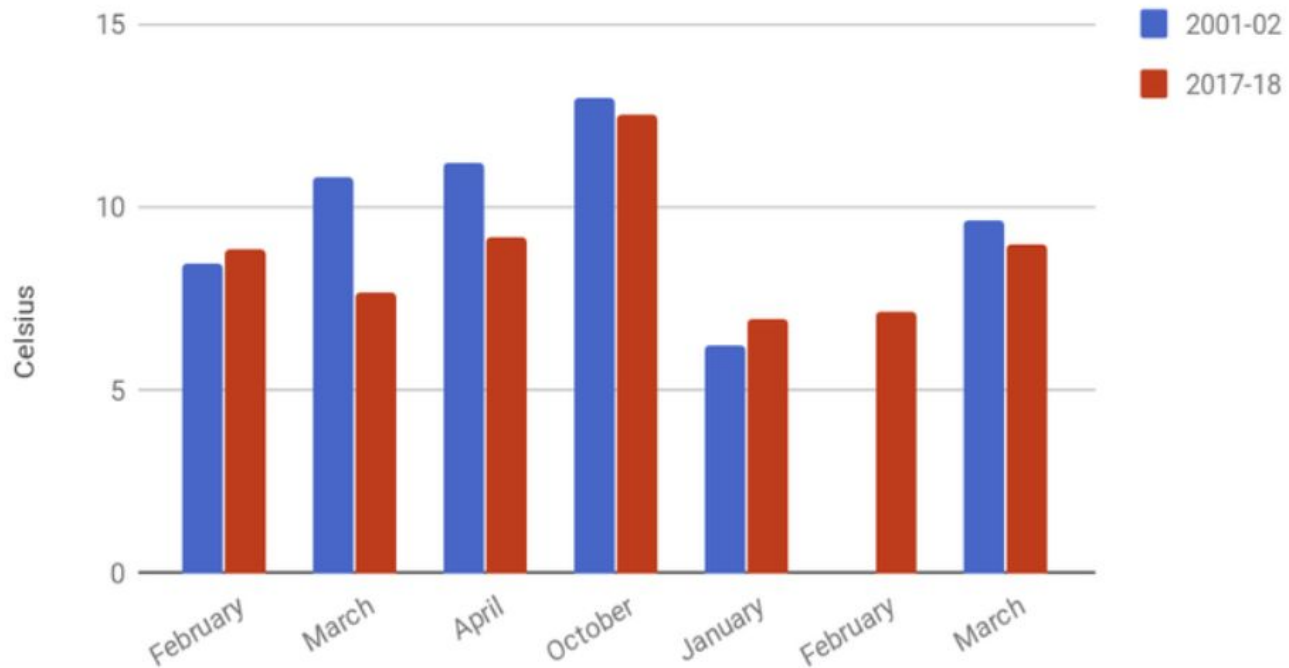
**ADULT SALMON= BELOW 15.6 DEGREES CELSIUS**

**JUVENILE SALMON= BELOW 13.9 DEGREES CELSIUS**



# AVERAGE WATER TEMPERATURE COMPARISON

Average Water Temperature for each month in Degrees Celsius





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COMPARISON OF

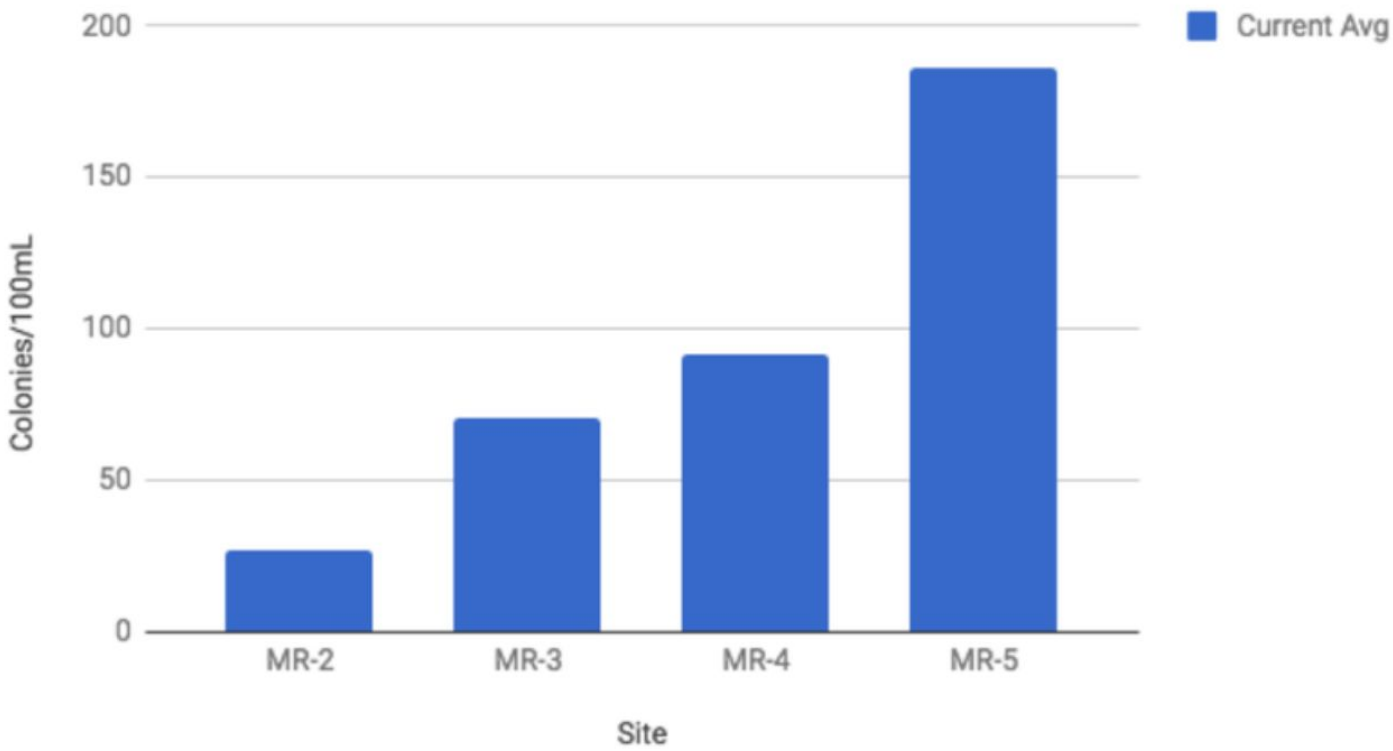
***E. COLI AT  
EACH SITE***

- E. coli is a type of coliform bacteria that comes from fecal waste
- EPA Maximum accepted value is 406 colonies per 100mL
- State of Oregon maximum accepted value: 235 colonies/100mL
- Highest concentration of e.coli is in MR5, the outlet of the Mill Race into the Willamette River

OPTIMAL LEVELS:  
EPA= <235/100ML  
DEQ= <406/100ML.

# COMPARISON

E. coli Population







COMPARISON OF

# ***COLIFORM BACTERIA CURRENT AND PAST***

- E. coli colonies were reduced sharply in MR5 but have increased in other sites
- Dogs, waterfowl, and other land animals contribute to increases in E. Coli
- All current levels are acceptable

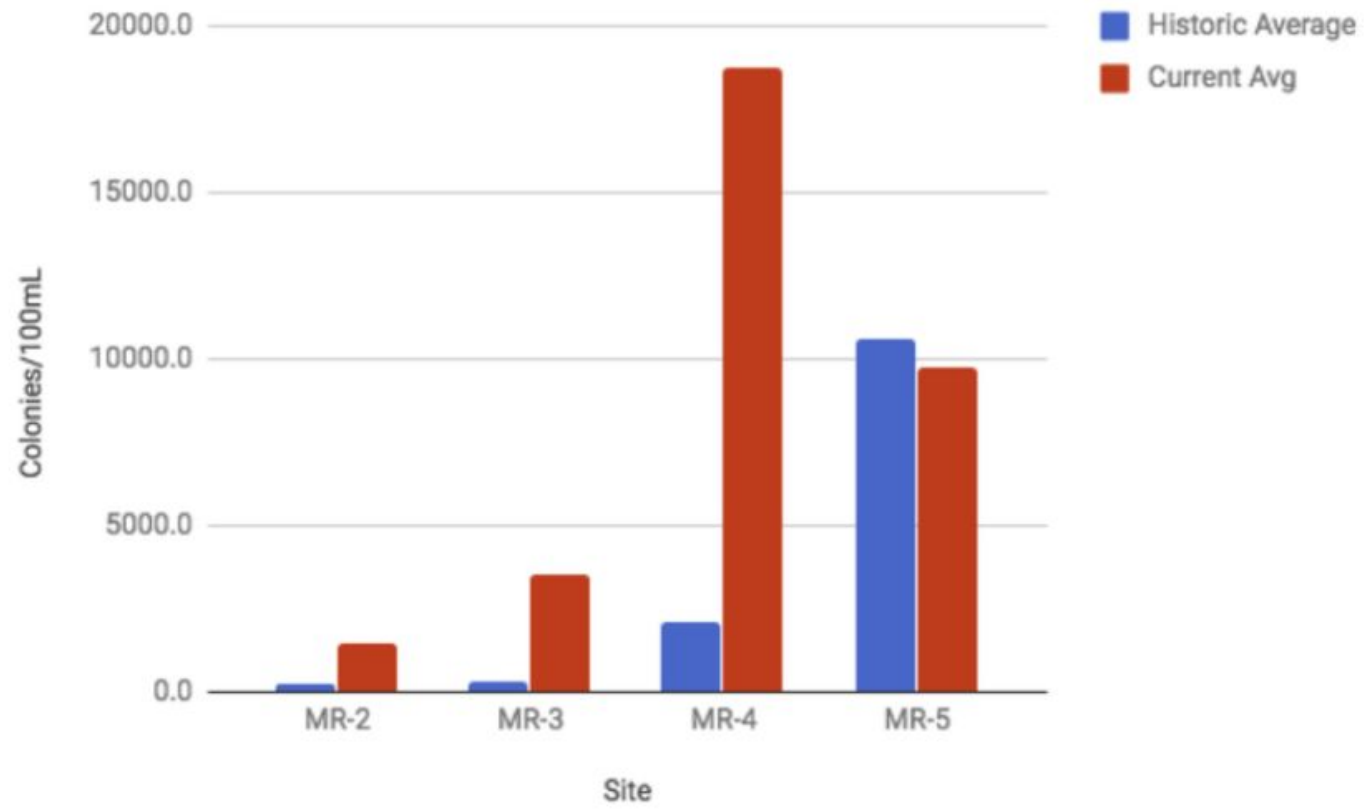
**OPTIMAL LEVELS:**

**GENERAL=FEWER THAN 1000 COLONIES/100ML,**

**FOR SWIMMING=FEWER THAN 200 COLONIES/100 ML (STATE OF KENTUCKY RIVER STANDARDS)**

## COLIFORM BACTERIA PAST AND CURRENT

# COMPARISON



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COMPARISON OF

# ***NITRATES***

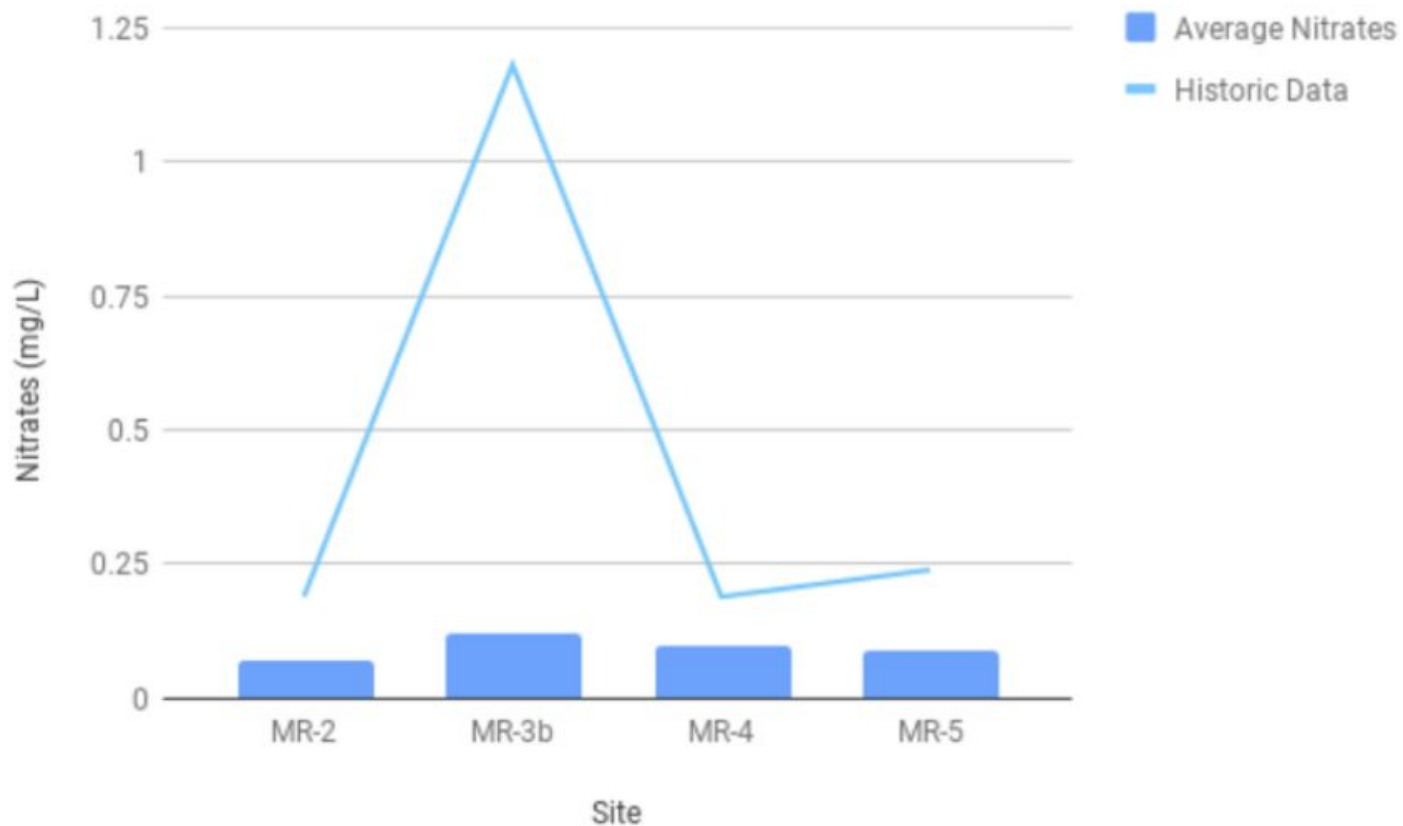
HISTORIC VS CURRENT AND BY  
MONTH

- Historically, the nitrate levels are higher than they are now.
- Compared to the rest of the sites, MR-3b has had more of a reduction in the amount of nitrates.

OPTIMAL LEVELS:  
FOR SALMON= ~0.06 MG/L.  
OTHER WARM-WATER FISH=~0.50 MG/L

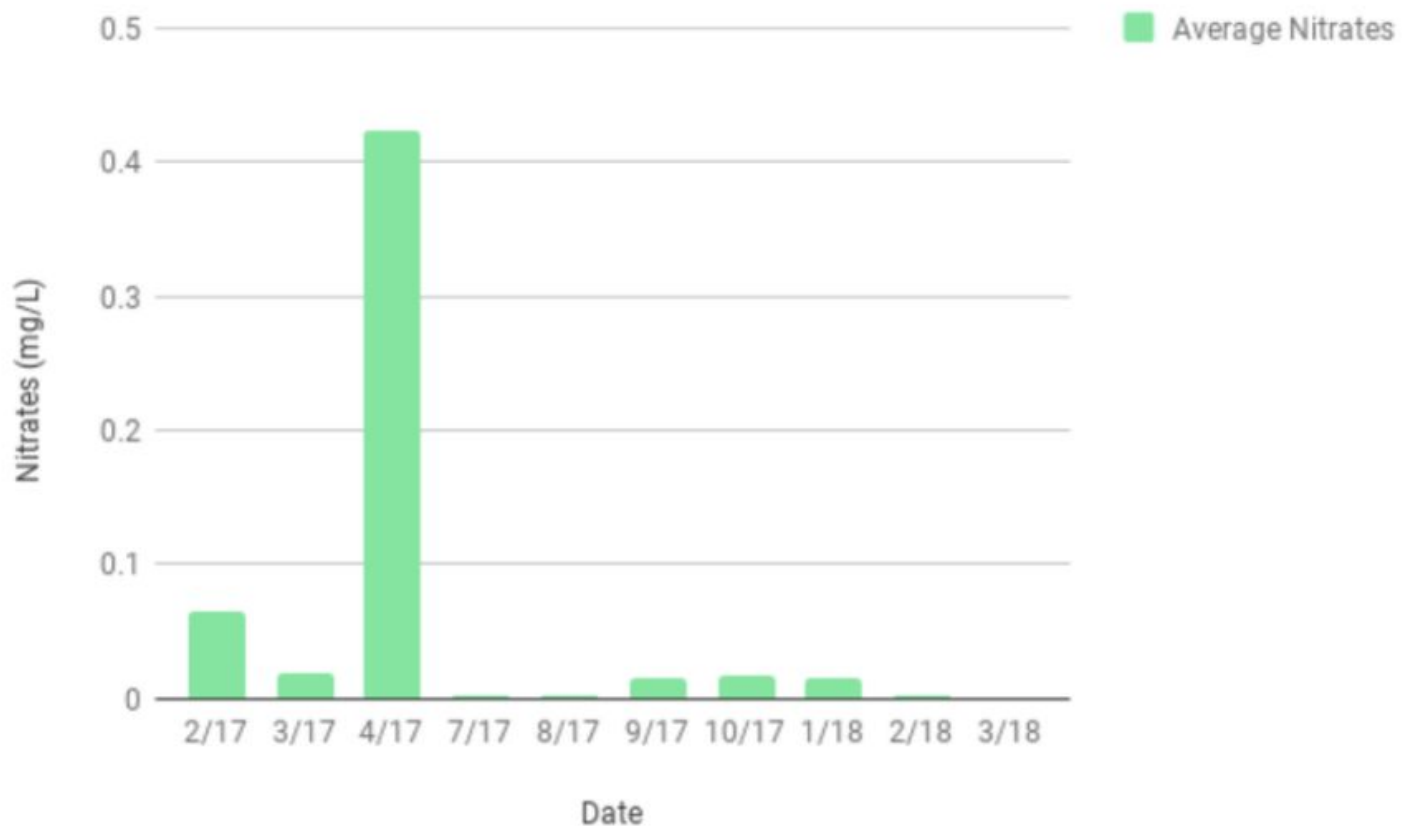


# NITRATES IN MILL RACE- HISTORICAL AND CURRENT COMPARISON

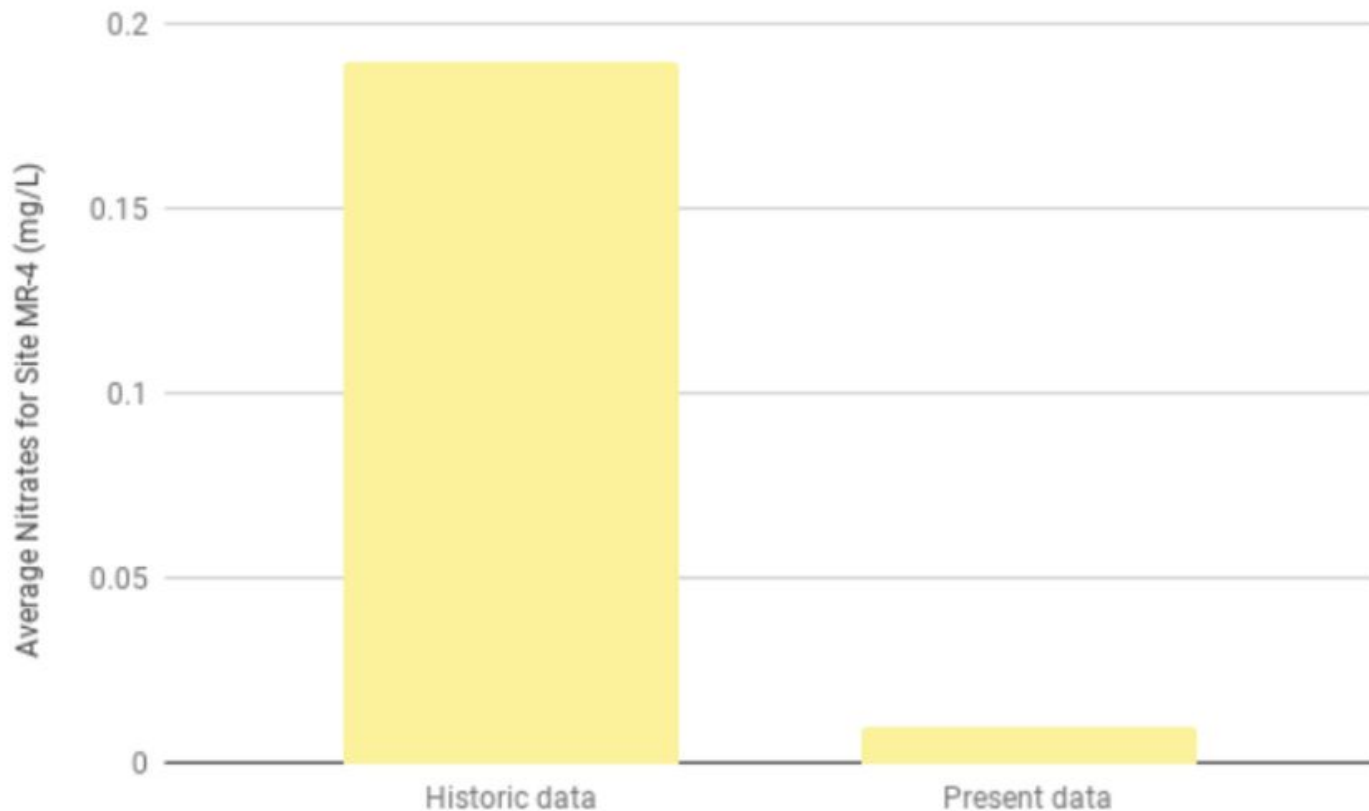


## NITRATES IN MILL RACE- CURRENT BY MONTH

# COMPARISON



# NITRATES IN MILL RACE- SITE 4; HISTORIC AND CURRENT COMPARISON





# CONCLUSIONS

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- E. coli is dropping significantly but the Mill Race outlet continues to have the highest concentration
- The average level of dissolved oxygen in the Mill Race has been decreasing since we began measuring it in the 2001-02 period, despite a simultaneous decrease in temperature
- Over time, the nitrate levels in the Mill Race have drastically decreased.



AND A HUGE

**THANK  
YOU  
TO:**

*Stephanie Lawless, Stuart  
Perlmeter, Jesse Jones,  
Todd Miller, McKenzie  
Watershed Council,  
Springfield Museum, and  
Willamalane*