

Lauren Brownlee

ePortfolio



ABOUT MY WORK



EDUCATION & WORK

I am currently studying Snow Science and Microbiology at Montana State University, with course emphasis on extremophile microorganisms in glacial habitats. I am working as a manager at Bar Nine and am the event manager for the summer music festivals in Bozeman

BACKGROUND

Growing up in Coeur d'Alene, Idaho I have always had a love for the outdoors and finding creativity in all the small things in life. From an early start in school I was heavily involved in many organizations and often took point on designing yearly club apparel and trinkets, as well as incorporating art into any class project that I could. This has evolved into the numerous design and marketing projects I have been apart of in my higher education and most recent job opportunities.

SKILLS & EXPERIENCE

EXPERIENCE

MAY 2021 - current

Management/marketing full time at Bar Nine
Festival Event Manager for Bar Nine

SUMMER 2022

Marketing coordinator and board member of
Saddlepeak Productions

SKILLS

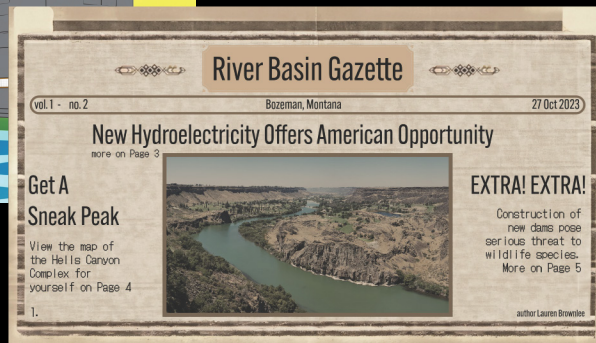
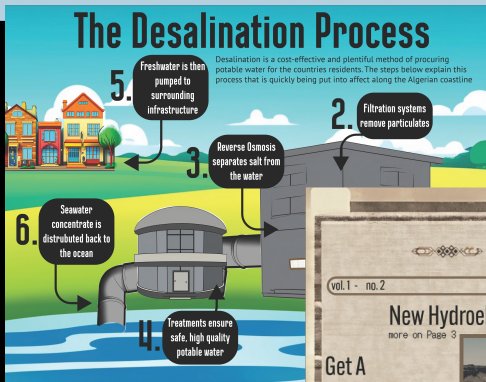
- Solid understanding of client deliverables
- Careful attention to detail
- Administrative and interpersonal skills
- Thoughtful project management
- Proficient in multiple design interfaces

P1 - Technical Briefs

CLIENT: Water and Society, Montana State University

OBJECTIVE

To bring large amounts of information together in easy-to-read graphics for any audience



P2 - The Woven Intracacies of Water Use

CLIENT: Water and Society, Montana State University

OBJECTIVE

This project was a dynamic comparison of each country's population density, represented by color coded values on the bottom row of yarn, and daily water use per capita, represented by color coded values on the top row of yarn. When folded in half, each row correlated to a specific countries data for a direct side-by-side comparison.



P3 - "The Effects of Urbanization on Water Quality a water confluence research project

CLIENT: Geomorphology,
Montana State University

OBJECTIVE

To work together in a semester project to create, plan, and see through a research expedition to support a hypothesis.

For this project I was tasked with forming a testable hypothesis, organizing the data, and assembling the final poster that is pictured here. An assortment of programs was used including Microsoft Excel, Adobe Express, and Canva

Effects of Urbanization On Water Quality and Stream Morphology: Comparing the Gallatin River and Bozeman Creek

Mackenzie Adams, Morgan Berg, Lauren Brownlee
ERTH 307: Geomorphology | December 2023

PROBLEM STATEMENT

How is water quality within streams and rivers in Gallatin Valley influenced by increasing urbanization and agricultural land use?

Urbanization in Gallatin Valley has been steadily increasing to meet the demands of the growing population (1). But the exact impacts of increased development/industrial land use on health and morphology of the local waterways is unknown. Therefore, data was collected upstream of, within, and downstream of urban areas to assess the impacts of development.

METHODS

Field Work and Data Collection


Four samples were collected from the Gallatin River and three samples from Bozeman Creek. At each site measurements of electrical conductivity, pH, water temperature, and the stream reach morphology were taken to assess water quality.

- Electrical conductivity and water temperature were determined using a Puckett pocket kit (2) and pH measurements were taken using a ThermoFisher wide-range pH test kit. The stream reach morphology was determined by assessing the key features present at each site based on descriptions by Bieman (3).

Data Analysis

- Excel was used to organize and create graphs of the data collected.
- ARCDE Online was used to create a map of the data collection site locations compared to population density.

BACKGROUND



Legend: Gallatin River, Bozeman Creek, Urban Area

Figure 1: Map showing the study area and data collection sites along the Gallatin River and Bozeman Creek. Sites are numbered as they are referenced in the results section.

CONCLUSIONS

It can be concluded from this study that agriculture and urbanization have noticeable effects on the water quality of near Bozeman watersheds. The electrical conductivity tests that were done in both the Gallatin River and Bozeman Creek show an increase as the sampling sites get closer to urbanized areas. A dramatic change in water quality was seen in the opposite direction. It what indicates a clear decrease in water quality which can be seen from the data collected. Elevated electrical conductivity of water can be an indicator that the water source has been polluted. The conductivity level cannot determine the exact pollutant, but it can help determine the health of the water supply and if the pollutant will be detrimental to the health of invertebrates and fish. Based on the fact that both the measured electrical conductivity for the Gallatin River and Bozeman Creek increased downstream of the areas of interest, it can be concluded that the extent of urbanization and agriculture does have a positive correlation with the electrical conductivity of water.

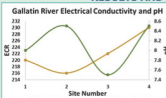
The pH of the Gallatin River did not show any remarkable conclusions as the data was variable and showed no overall trends for the sites sampled. The pH of Bozeman Creek showed a steady increase in relation to urbanization. However, based on the pH data gathered on Bozeman Creek they are all within the healthy range; a healthy pH range for water is 6.5-8.5.

Stream Reach Morphology

In urban areas waterways were seen to have decreased diversity and increased obstructions.

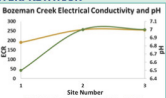
RESULTS AND INTERPRETATION

Gallatin River Electrical Conductivity and pH



Site Number	Electrical Conductivity Reading (µmhos/cm)	pH
1	~215	~8.2
2	~225	~7.8
3	~230	~7.6
4	~230	~7.4

Bozeman Creek Electrical Conductivity and pH



Site Number	Electrical Conductivity Reading (µmhos/cm)	pH
1	~100	~6.8
2	~150	~7.0
3	~200	~7.2

Figure 4: E, C, and pH data collected from the four sites along the Gallatin River. Figure 6: E, C, and pH data collected from the three sites along Bozeman Creek.

INTRODUCTION

Bozeman is situated in the heart of the Gallatin Valley, and has experienced a surge in population growth, becoming the fastest-growing metropolitan area in the United States over the past five years (1). This population growth has resulted in land use planning conflicts. Issues regarding the conversion of fertile and undisturbed lands into agriculture, forest/urban areas to accommodate the growing population have arisen.

The high frequency of impervious surfaces in urban areas significantly contributes to diminishing water tables, soil shortages (2), and increased flood risks (5). Additionally, agriculture is a known contributor to water quality issues and is exacerbated by pesticide usage and nutrient loading, due to fertilizer (3). Such issues pose a threat to the valley's blue-ribbon trout streams that support a large fishing industry and the local economy (4). The region's snowmelt further compounds water quality issues in the area as increased quickly transports pollutants and nutrients into water sources during the melt-growing season (3), further emphasizing the need for investigation into the effects of urbanization and agricultural land use on water quality in Gallatin Valley.

Electrical conductivity and pH levels will be conducted to understand the effects that agriculture and rapid urbanization has had on the region.

WATER QUALITY FINDINGS

Gallatin River Notable Findings:

- Water samples taken downstream of urban areas had a lower pH.
- Electrical conductivity readings generally increased the further downstream the samples were collected.
- Water temperatures generally decreased the further downstream the site was located.

Bozeman Creek Notable Findings:

- The pH of Site 1 was more acidic than Site 3 and 3.
- A substantial increase in Electrical Conductivity was observed from Site 1 near the wastewater compared to Sites 2 & 3 near downtown Bozeman.
- Water temperature increased the further downstream the site was located.

Stream Reach Morphology Comparison




Figure 7: Site 1 on Bozeman Creek. Figure 8: Site 2 on the Gallatin River. Figure 9: Site 3 on the Gallatin River. Figure 10: Site 4 on the Gallatin River.

Figure 8: Site 2 on the Gallatin River. Figure 10: Site 4 on the Gallatin River.

STREAM REACH MORPHOLOGY FINDINGS

Gallatin River Notable Features:

- Site 1: Flume bed channel, no snags, little debris
- Site 2: Pool-riffle channel, moderate diversity, smaller boulders, vegetated banks
- Site 3: Pool-riffle channel, moderate diversity, vegetated banks
- Site 4: Pool riffle, highly sinuous, braided, vegetated and non-vegetated banks

Bozeman Creek Notable Features:

- Site 1: Flume bed channel, little diversity
- Site 2: Flume bed channel, no diversity
- Site 3: Flume bed channel, no diversity, river flows out of a pipe, other human placed obstructions (drains, concrete, etc.)

Generally, the Gallatin River has a more natural morphology compared to Bozeman Creek which has been highly altered by urbanization.

REFERENCES

- Montana Department of Transportation. (2022). *Montana's Population Growth and Urbanization Trends*. Retrieved from <https://www.mdt.mt.gov/Portals/0/About/Planning/Population%20Growth%20and%20Urbanization%20Trends.pdf>
- U.S. Environmental Protection Agency. (2018). *Water Quality Criteria for pH*. Retrieved from <https://www.epa.gov/watershed/water-quality-criteria-ph>
- U.S. Environmental Protection Agency. (2018). *Water Quality Criteria for Electrical Conductivity*. Retrieved from <https://www.epa.gov/watershed/water-quality-criteria-electrical-conductivity>
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ACKNOWLEDGMENTS

Special thanks to Dr. Timothy W. Bieman, the 2023 Lakeside for their time and insight throughout the completion of this project.

P4 - Advertisements & Promotions

CLIENT: Bar Nine, Bozeman Montana

OBJECTIVE

To create advertisements for Bar Nine's social media accounts and daily promotion pages to help gain more business and professionalism



311 E MAIN ST
BOZEMAN, MT

- MULES -

LONDON MULE \$6
Boroday gin, simple syrup, ginger beer, and lime juice, garnished with a lime wedge

KENTUCKY MULE \$6
Jack Daniels or Jameson, ginger beer, and lime juice, garnished with a lime wedge

MOSCOW MULE \$6
Try a classic favorite with a spin. Available with Tito's, cucumber, gear, huckleberry, nectarine, blueberry, raspberry, lemon, orange or vanilla

- COCKTAILS -

CITRUS GIN SPRITZ
Handrick's Gin with fresh squeezed orange and lemon juice and soda water

APEROL SPRITZ
A summer classic, Aperol topped with prosecco and soda water, garnished with an orange wheel

HUCKLEBERRY OLD FASHIONED
Makers Mark, huckleberry liqueur, bitters, and garnished with a maraschino cherry

BLUEBERRY CREAM
Vodka, blueberry, cinnamon, lemon, mint, cream

- DRAFT BEER -
BUY ONE, GET ONE
THEY BOTH MUST BE AT THE BAR TO GET

CIDER ROTATOR	NEW BELGIUM IPA ROTATOR	SEASONAL ROTATOR
CDORS LIGHT	COLD SMOKE SCOTCH ALE	GUINNESS
	WODELO	
ADD A SHOT FROM THE LIST BELOW - \$4		
PENDELTON	JAMESON	FIREBALL
40% AGAVE	HORNITOS	TITOS
	DISARONNO	44 NORTH
		STOLI VANILLA
		FERNET

- STAFF FAVORITES -

IRISH ICE CREAM
Jameson Orange,
Disaronno, orange juice,
pineapple juice, Sprite

BLUE COSMOPOLITAN
Malibu, Blue curacao,
pineapple

- WINE -

JOSH PHELPS ROUNDED Cabernet, California

APOTHC RED Red Blend, California

LOSCARO Malbec, Argentina

CLOUDLINE Pinot Noir, Willamette Valley Oregon

BARNARD Chardonnay, Washington

CHASING VENUS Sauvignon Blanc, New Zealand

LAMARCA Prosecco

BAR IX

ALIEN INVASION

11 MARCH 9 PM

\$6 MIDORI SOURS

\$3 ALIEN BLOOD SHOTS

DJ SHEDRACK



BREAKFAST OF CHAMPIONS

Homecoming 2023

\$30 INCLUDES AN ALL-YOU-CAN-EAT BREAKFAST BUFFET WITH BOTTOMLESS BLOODIES AND MIMOSAS

\$20 JUST THE DRINKS - BOTTOMLESS BLOODIES AND MIMOSAS

OPEN EARLY!

9/30 9AM-12PM



11:00AM - 02:00PM

\$20 BOTTOMLESS

EVERY SATURDAY & SUNDAY



P5 - Advertisements

CLIENT: Saddlepeak Productions, Bozeman Montana

OBJECTIVE

To make fun, appealing graphics and logos to attract a lively crowd



LET'S WORK TOGETHER

*GET IN TOUCH
IF YOU'D LIKE
TO DISCUSS A
APROJECT OR
COLLABORATE
ON AN IDEA.*

