

# Monitoring Soil Health at the Ashton Prairie Living Laboratory

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We continued to monitor the soil health at Ashton Prairie, with a baseline study done by Megan Lenss. With an initial baseline study done, we were able to compare our data to see any improvements or losses with soil health factors.

## Motivation

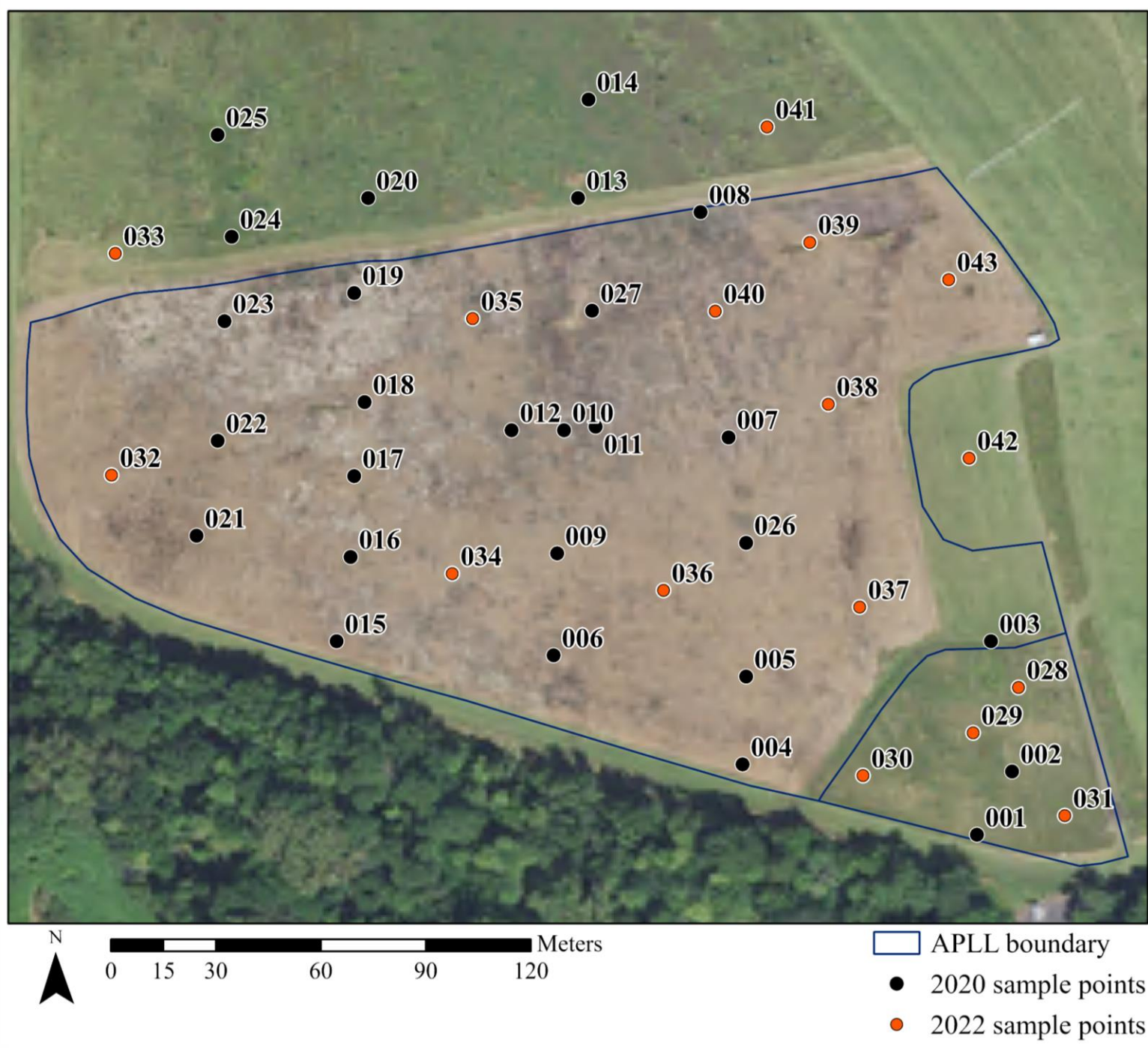


Figure 1. Ashton Prairie Living Laboratory outline with sample points taken in 2020 and 2022.

- An initial baseline study of soil health was conducted by Megan Lenss in 2020, prior to any planting.
- The prairie was planted in 2020 and 2022.
- Soil health is an important factor in the overall success of the prairie.
- Monitoring the soil health allows us to see trends in the development of the prairie, and provides information for other relevant studies.

## Methods

### Soil Sample Collection

- 43 samples were collected using a spade, at a depth directly below the organic layer to about 6 inches, creating approximately 2 cups of soil.
- A Trimble GPS was used to stakeout the previous 27 points taken by Megan Lenss, and to add an additional 16 sample points.
- Samples were sent to Midwest Laboratories for chemical analysis, including the chemical characteristics and a Haney Number calculation.
- Results were organized in Microsoft Excel, and ArcGIS Pro was used to analyze the data spatially.

### Haney Number Calculation

$$\text{Haney Number} = \frac{\text{CO}_2 \text{ burst}}{10} + \frac{\text{water extractable organic C}}{100} + \frac{\text{water extractable organic N}}{10}$$

- The Haney number measures the respiration of soil microbes, and water-soluble carbon and nitrogen.
- A high Haney number is ideal, and we want to see this number increase as the prairie continues to develop.

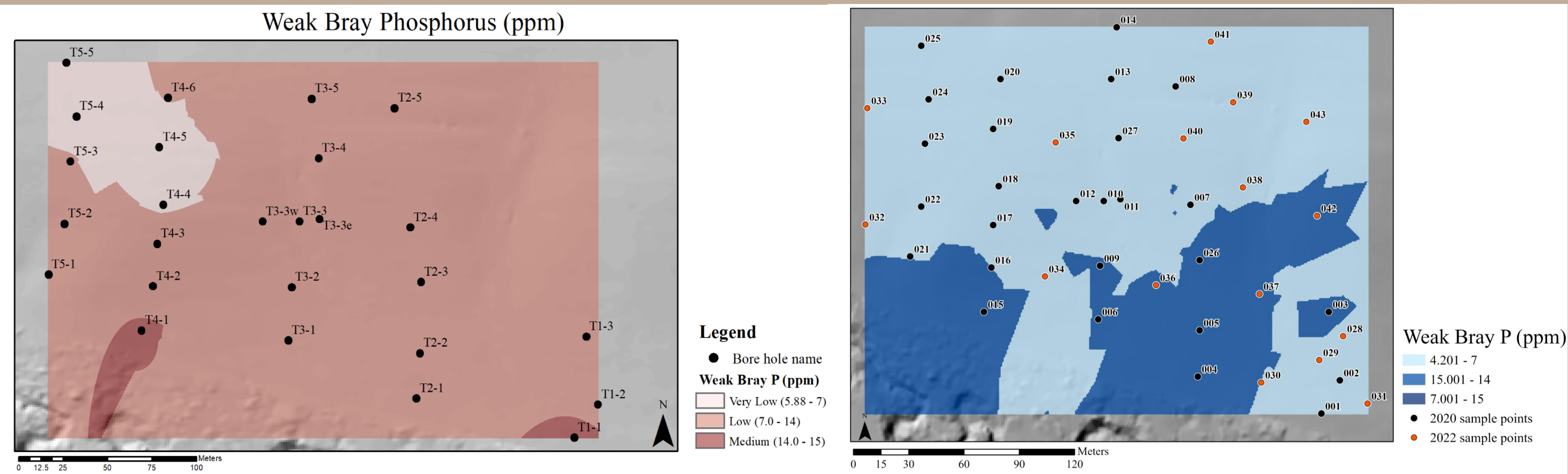


Figure 2. Comparison of 202 and 2022 weak brey phosphorus.

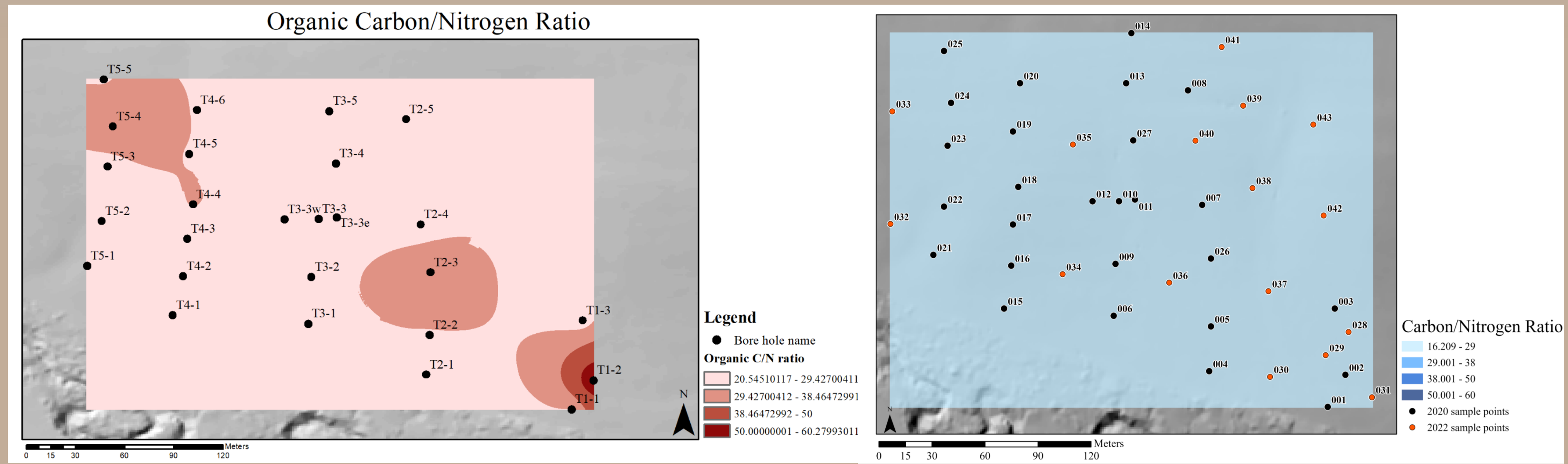


Figure 4. Comparison of 2020 and 2022 organic carbon to organic nitrogen ratio.

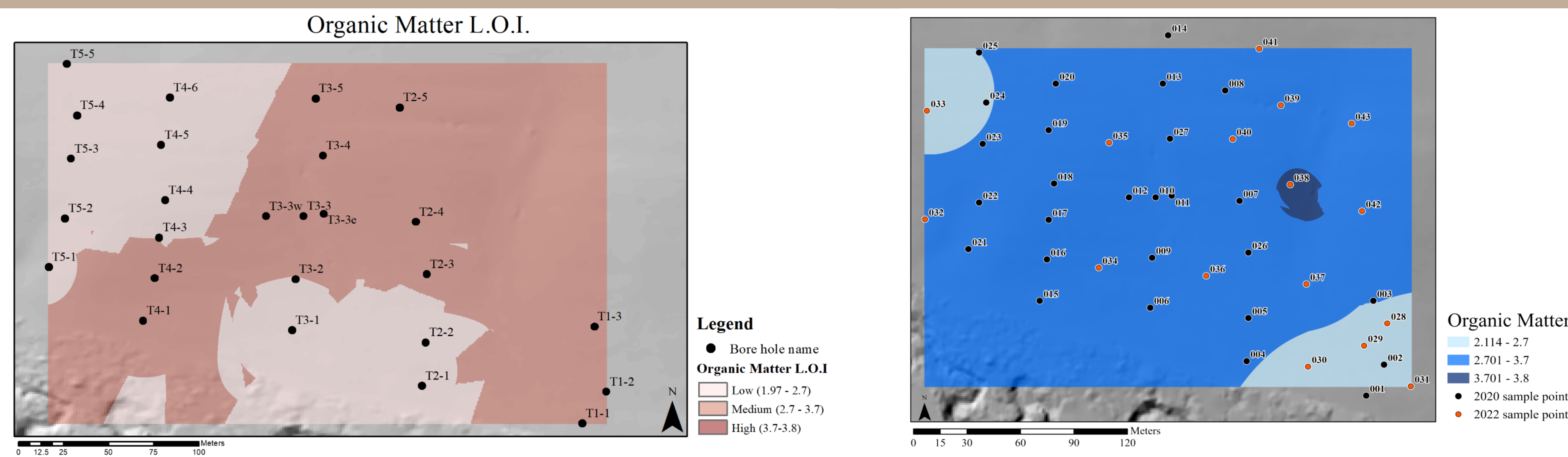


Figure 3. Comparison of 2020 and 2022 organic matter.

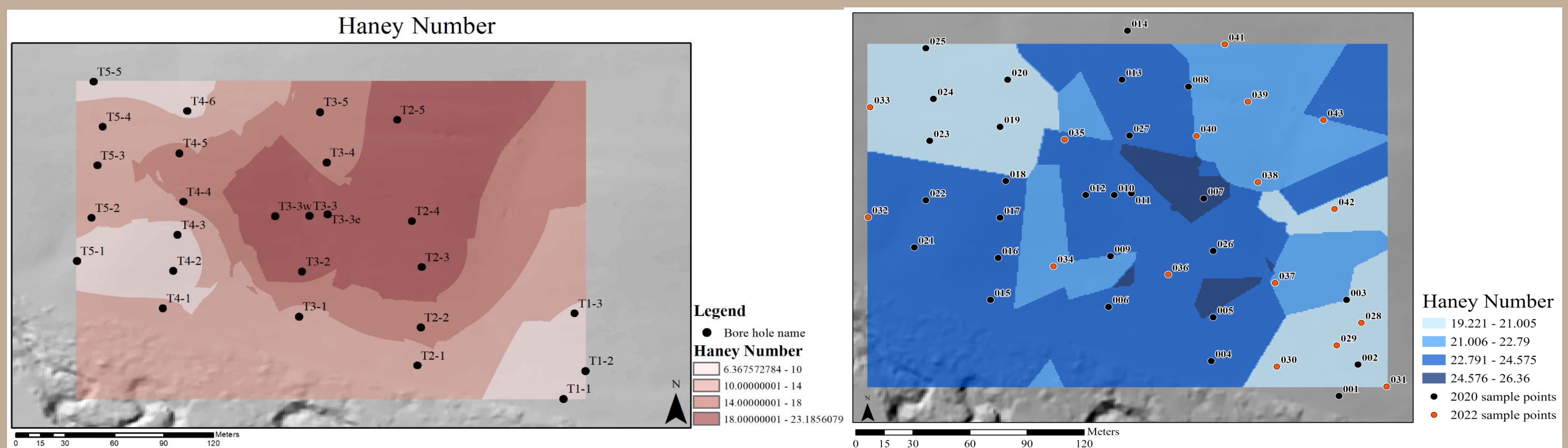


Figure 5. Comparison of 2020 and 2022 Haney number.

## Results

Overall, we see variation in the different chemical characteristics of the soil health from 2020 to 2023, but it's difficult to identify a trend based on this data. Notably, there is a significant increase in the CO<sub>2</sub> burst, organic carbon, organic nitrogen, and the Haney number; there is a significant decrease in the weak/strong bray phosphorus, calcium, and organic carbon to nitrogen ratio. Causes for the increase of certain characteristics could be due to the prairie developing appropriately, which is ideal. Causes for the decrease of certain characteristics is unknown.

PARAMETER	MEAN		MAXIMUM		MINIMUM		STDEV		P-VALUE
	2020	2022	2020	2022	2020	2022	2020	2022	
ORGANIC MATTER %	2.7	2.6	3.8	3.9	1.6	1.5	0.5	0.6	0.605
WEAK BRAY PHOSPHORUS	9.0	6.3	21.0	16.0	5.0	3.0	3.7	3.0	0.002
STRONG BRAY PHOSPHORUS	14.0	10.0	37.0	28.0	6.0	5.0	8.3	5.2	0.018
POTASSIUM ppm	104.1	94.8	175.0	161.0	63.0	52.0	28.6	24.3	0.157
MAGNESIUM ppm	300.3	265.3	518.0	568.0	156.0	139.0	98.1	101.9	0.166
CALCIUM ppm	1920.7	1756.1	2853.0	2498.0	1400.0	1224.0	312.5	326.8	0.043
SOIL pH	6.2	6.1	7.2	7.0	5.7	5.6	0.3	0.3	0.159
BUFFER INDEX	6.7	6.7	6.9	6.9	6.6	6.5	0.1	0.1	0.604
CATION EXCHANGE CAPACITY	14.2	13.3	21.5	19.4	9.9	9.0	2.7	3.0	0.187
CO <sub>2</sub> BURST (1-DAY)	110.7	180.9	215.0	331.0	15.0	46.0	59.3	61.3	0.000
ORGANIC CARBON (ppm)	185.0	213.0	234.9	365.0	120.5	101.2	31.1	53.5	0.018
ORGANIC NITROGEN (ppm)	6.9	11.1	10.8	17.2	2.0	4.5	2.0	3.0	0.000
ORGANIC C/N RATIO	28.3	19.2	60.3	23.6	20.7	16.2	7.6	1.8	0.000
HANEY NUMBER	13.6	21.3	24.6	36.5	4.3	8.0	6.0	6.1	0.000

\*2-sided, equal variance

significant decrease  
significant increase

## Future Work

- Continue to monitor soil health at the Ashton Prairie as the prairie develops, with possibly additional points to expand and gain precision with data analysis.
- Compare soil health and chemistry to soil profiles of the different slopes and testing points to analyze any correlations.
- Compare this data to other, more established, prairies. (i.e. virgin prairies, 10-year-old prairies, etc.)

## Acknowledgements

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