

Who are We?

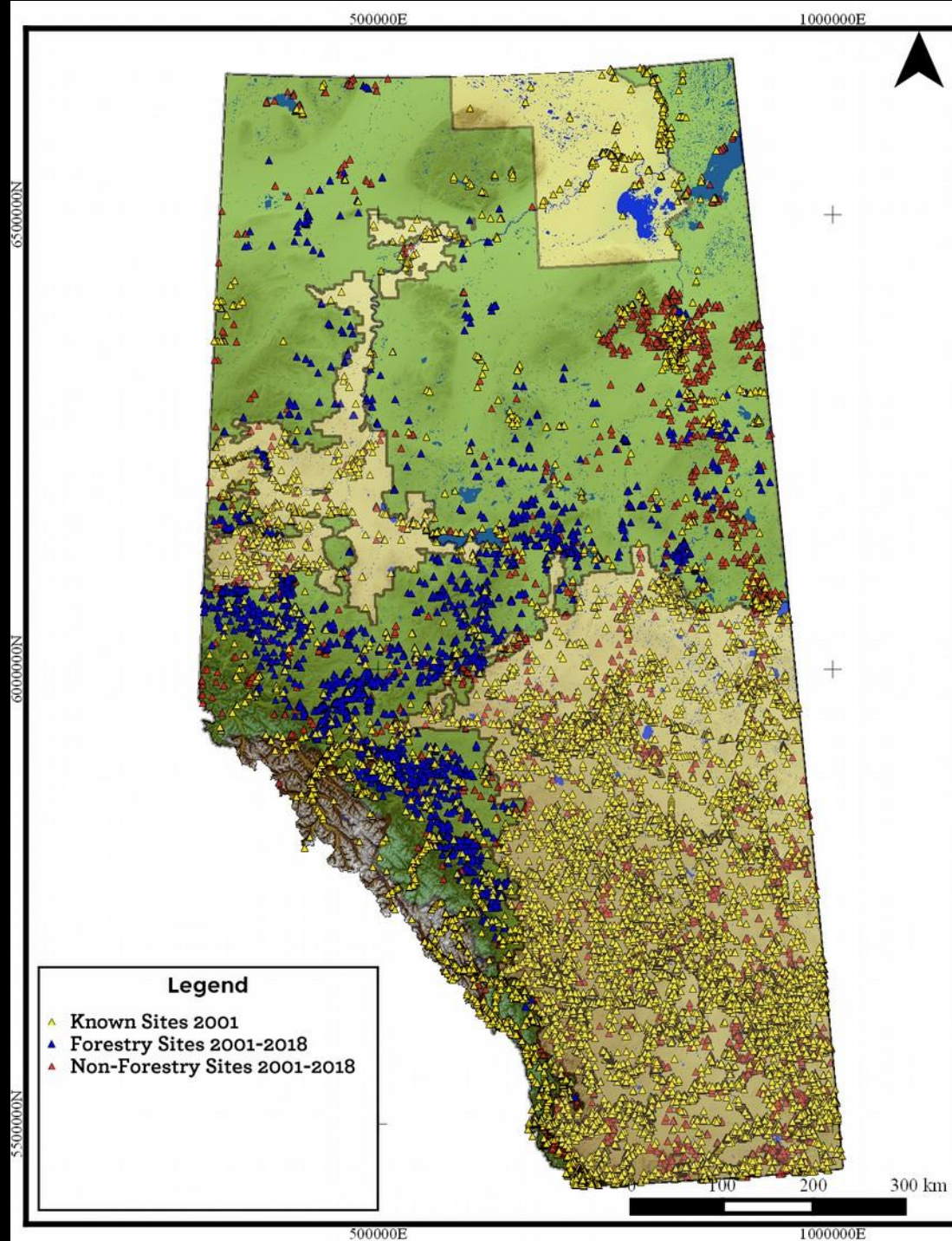


- Historical Resource
 - “any work of nature or of humans that is primarily of value for its palaeontological, archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest”



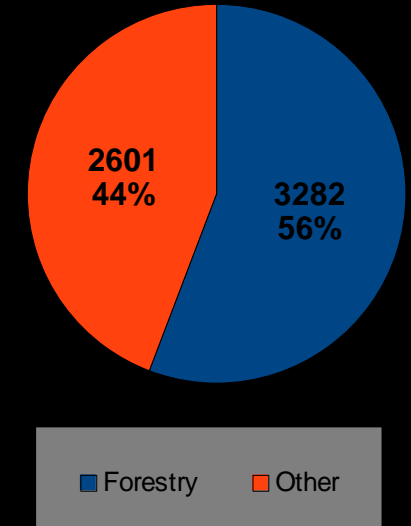
Archaeological Sites
Circa 2018

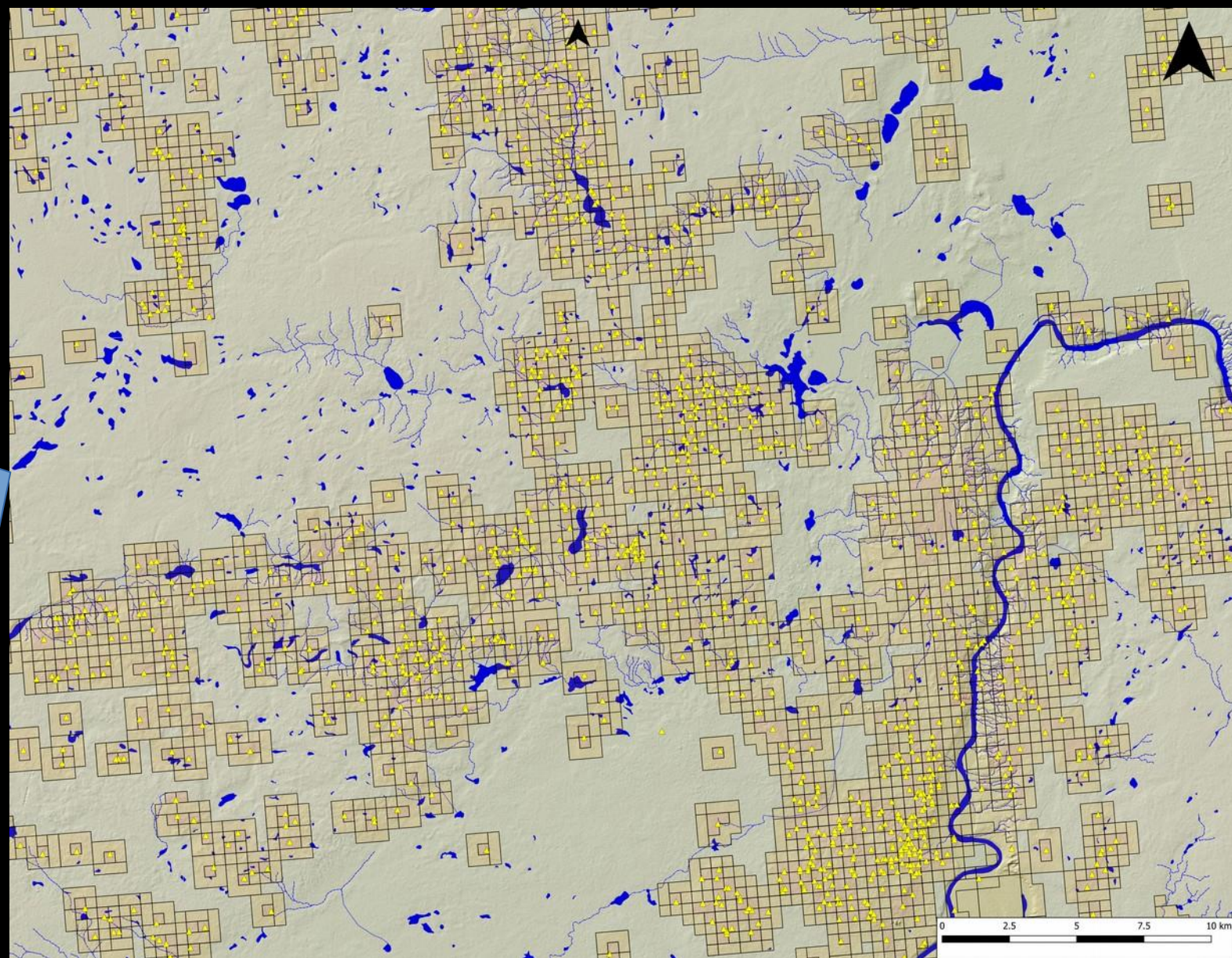
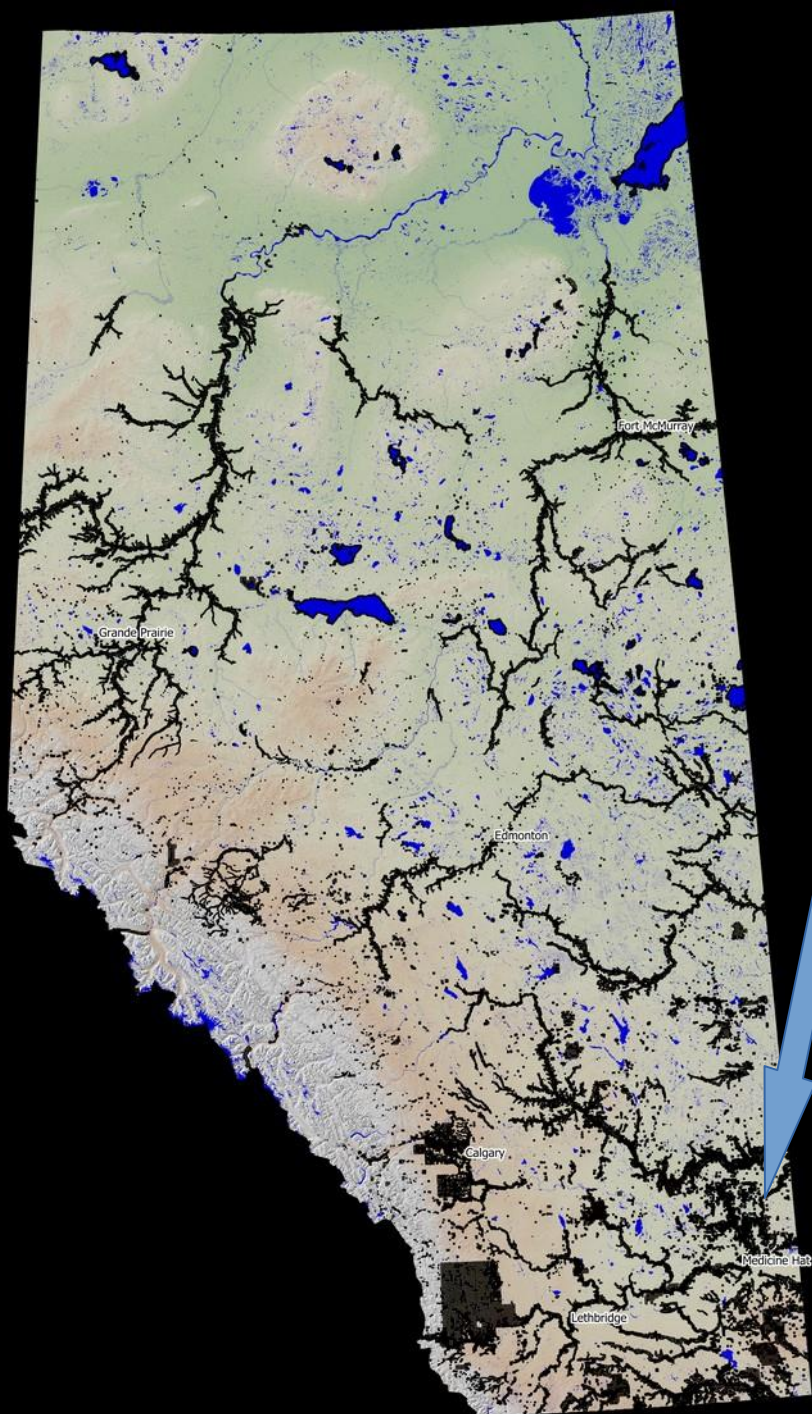
17 Years of Forestry
Archaeology



2001-2018

5883 Archaeological Sites
Recorded in the Green Area



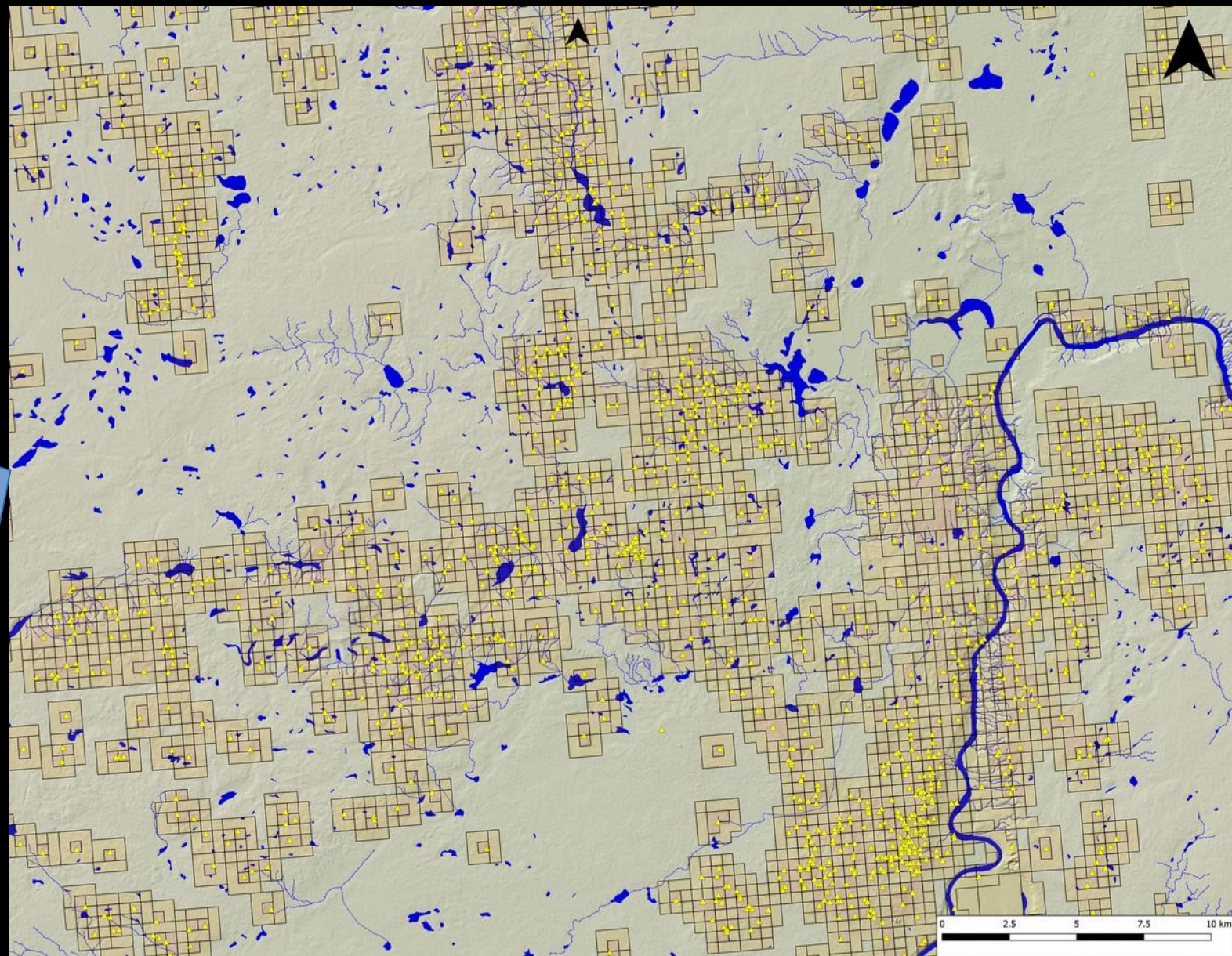
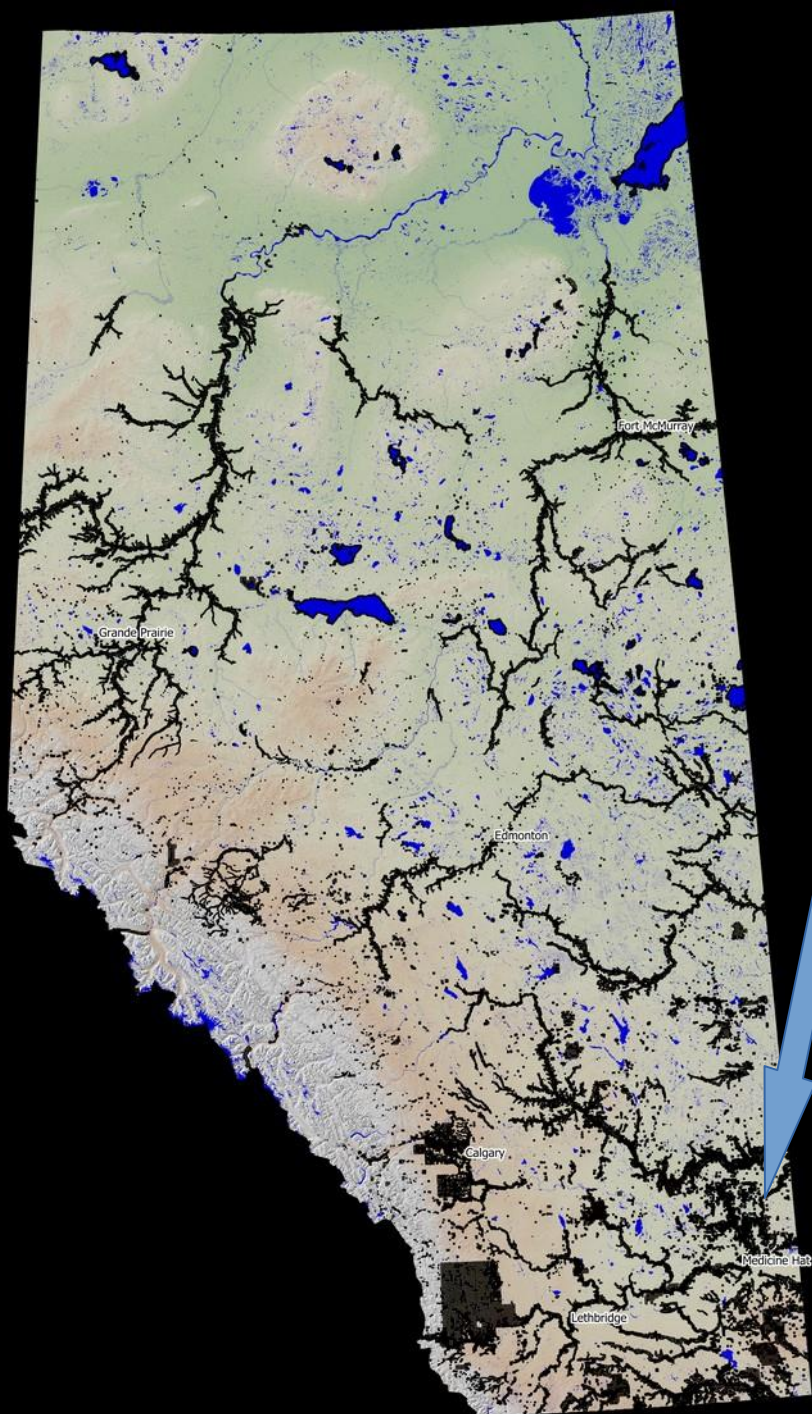




Grizzly Ridge Opal



10,000 Year Old Spearhead

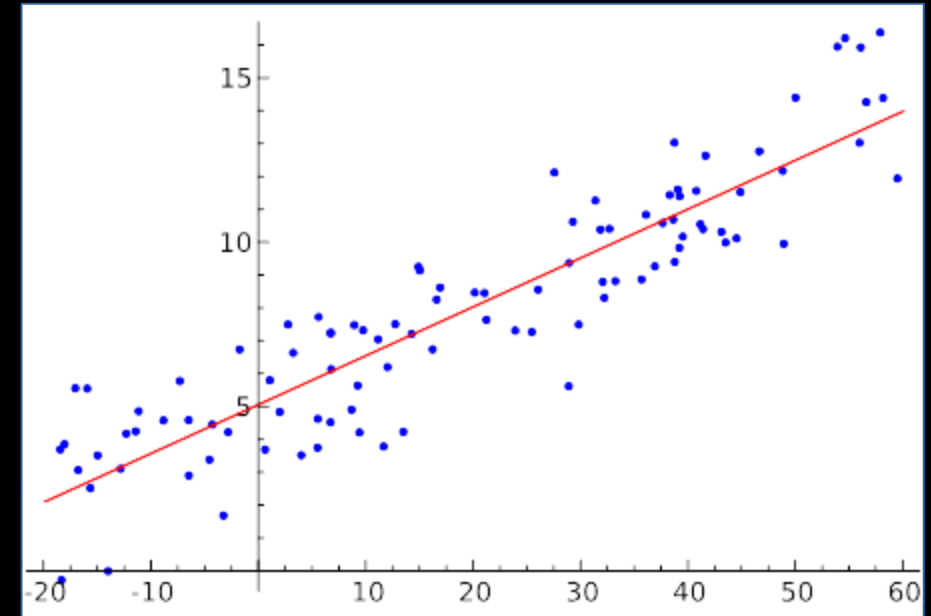


How Do We Know Where
Archaeological Sites Are?

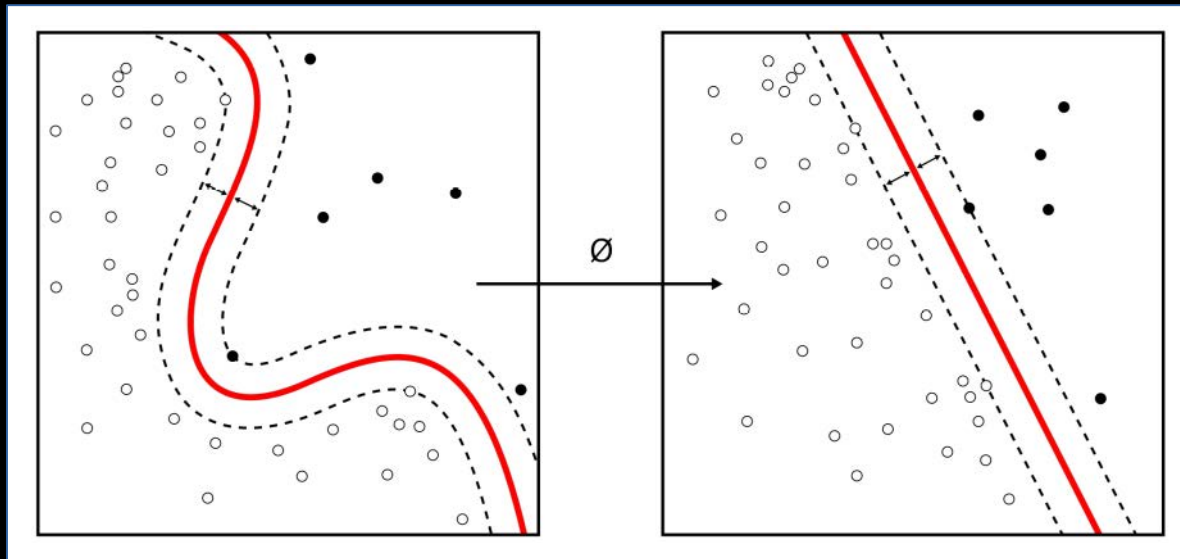


Early Archaeological Predictive Models

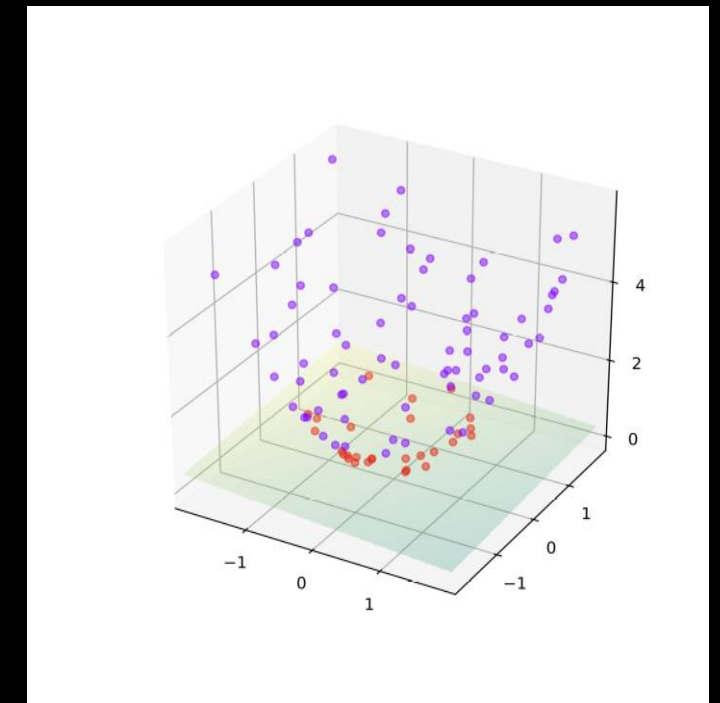
- Judgmental
 - $A+B \times C=D$
- Rule Based
 - If Then
- Regression Equations
 - $Y=a+bX$



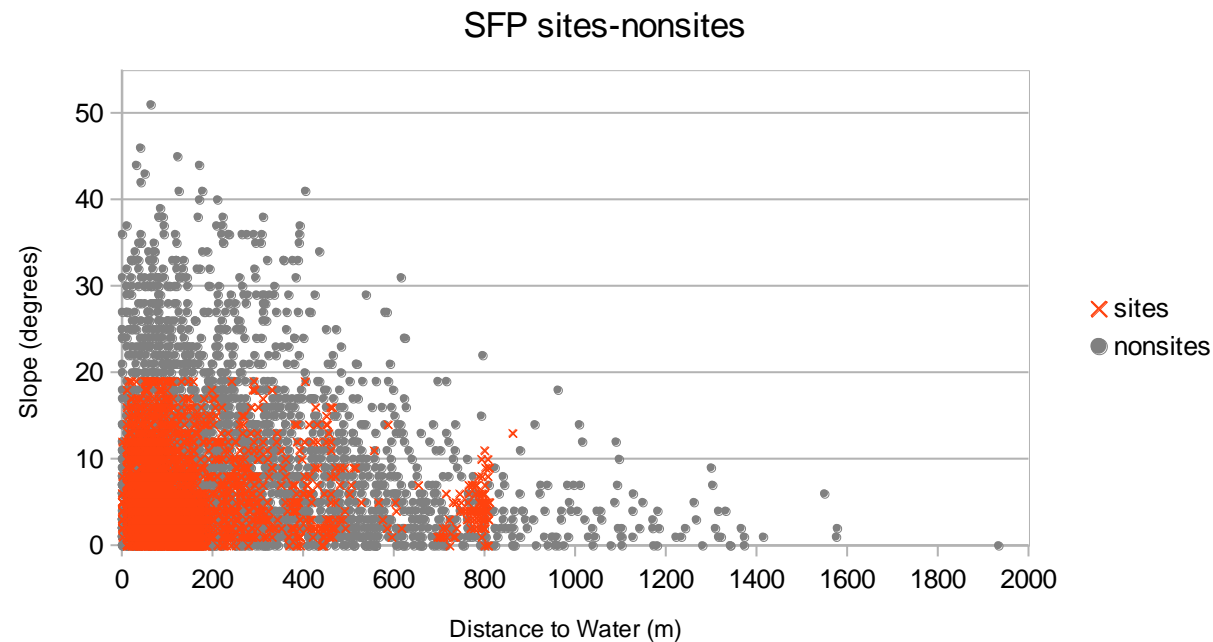
Basic Linear Regression



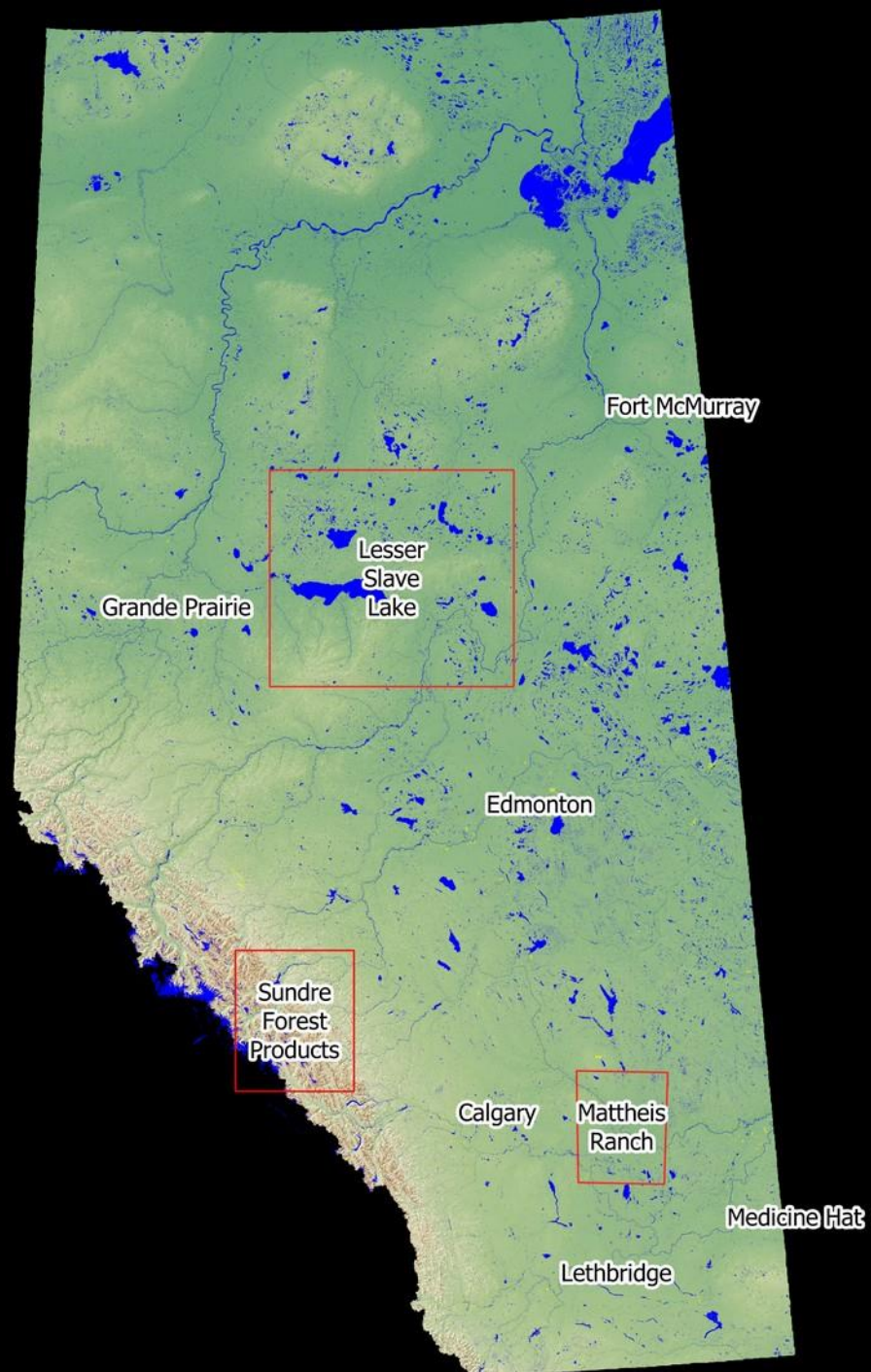
Basic Linear SVM Classification

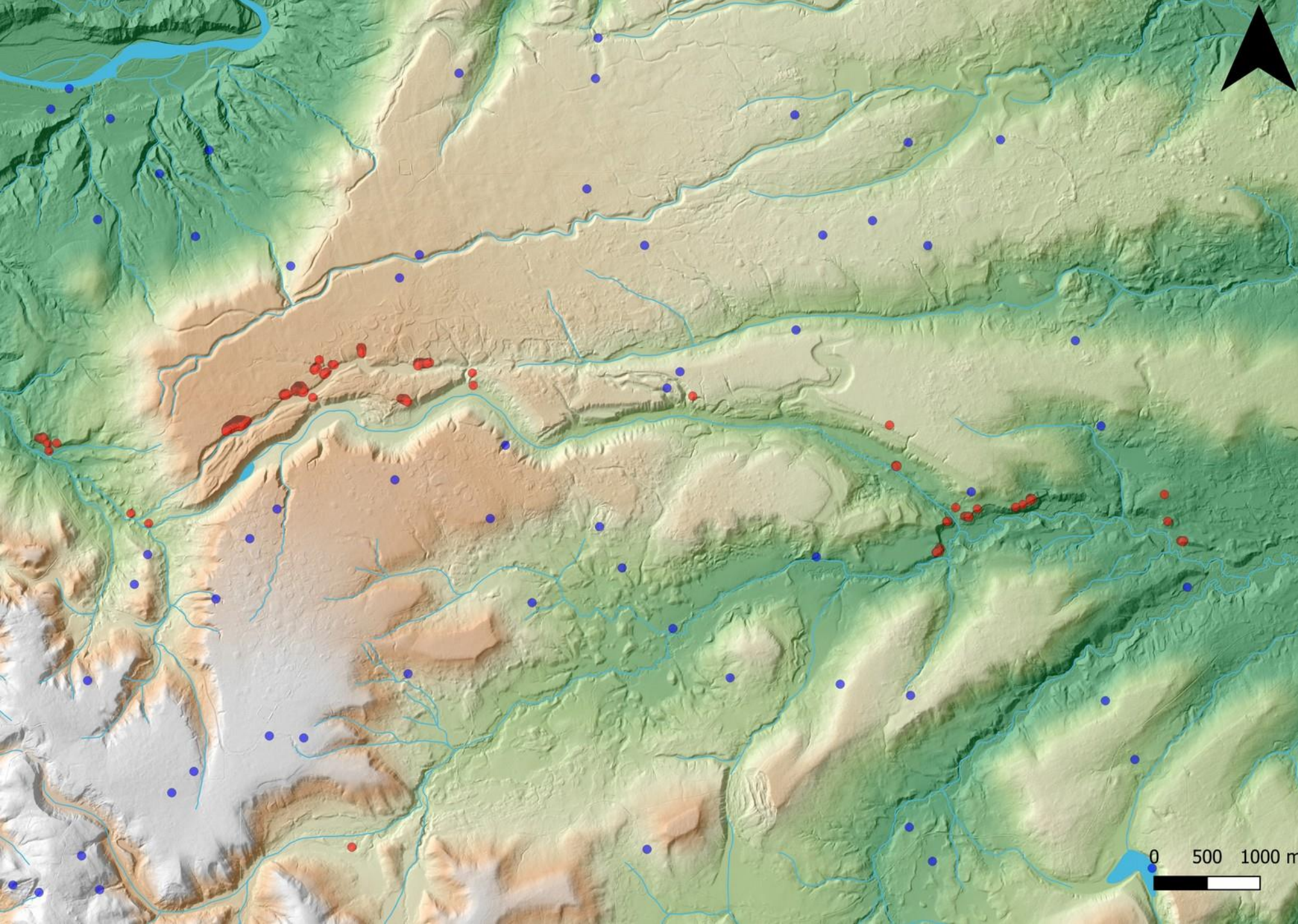


Support Vector Machines: A supervised learning algorithm that is used for classification and regression analysis



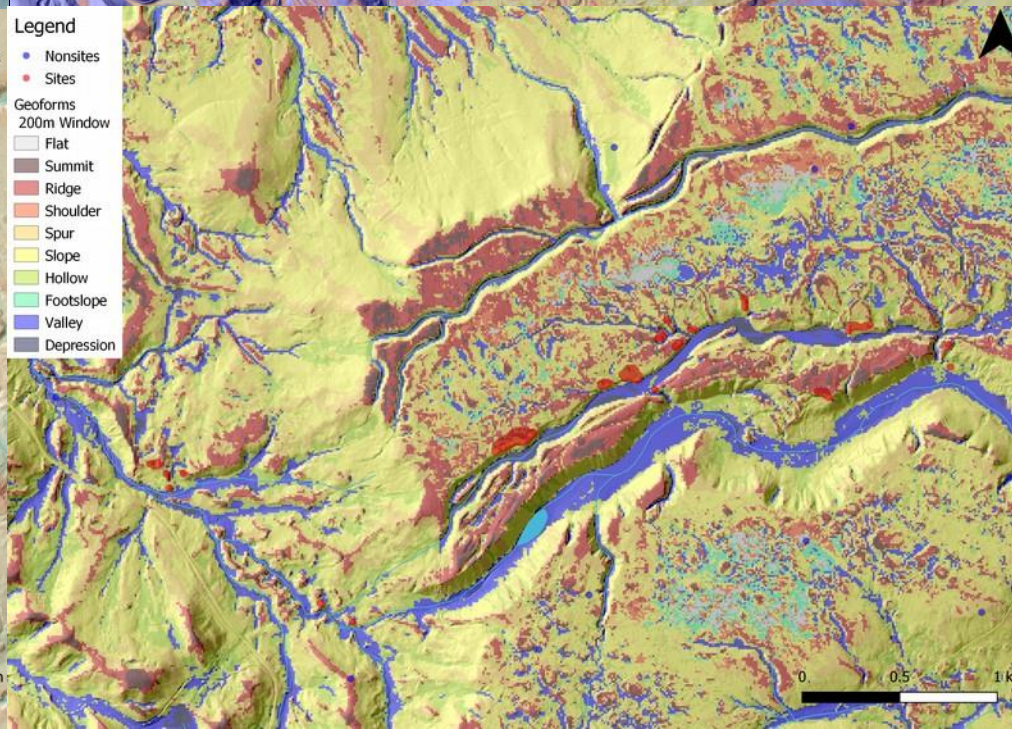
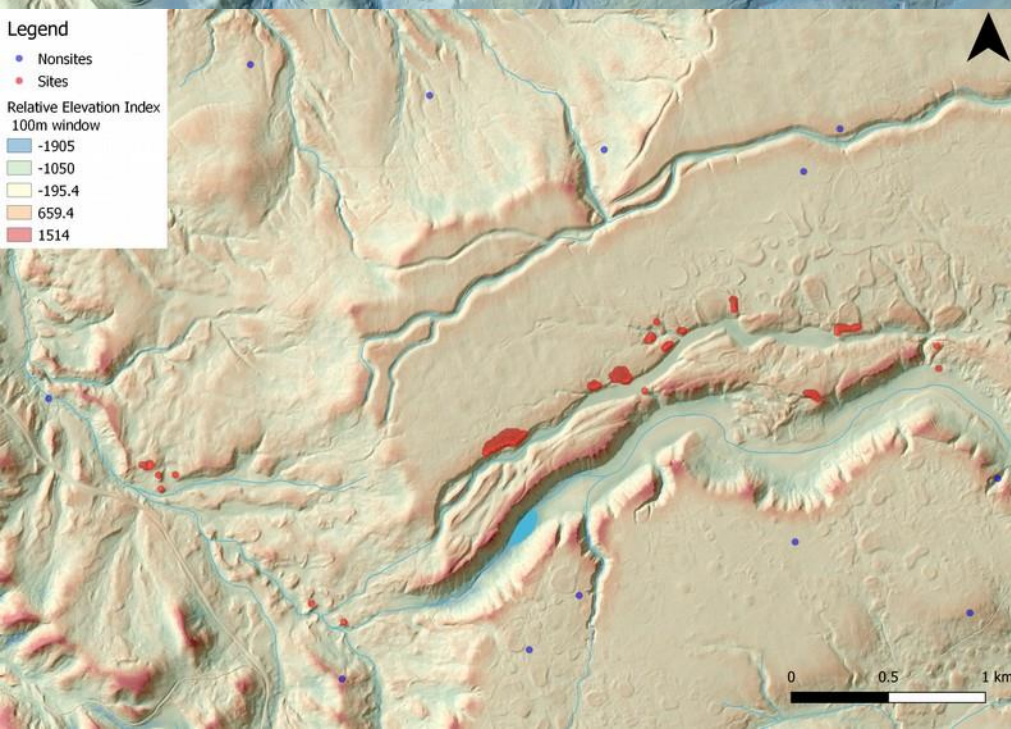
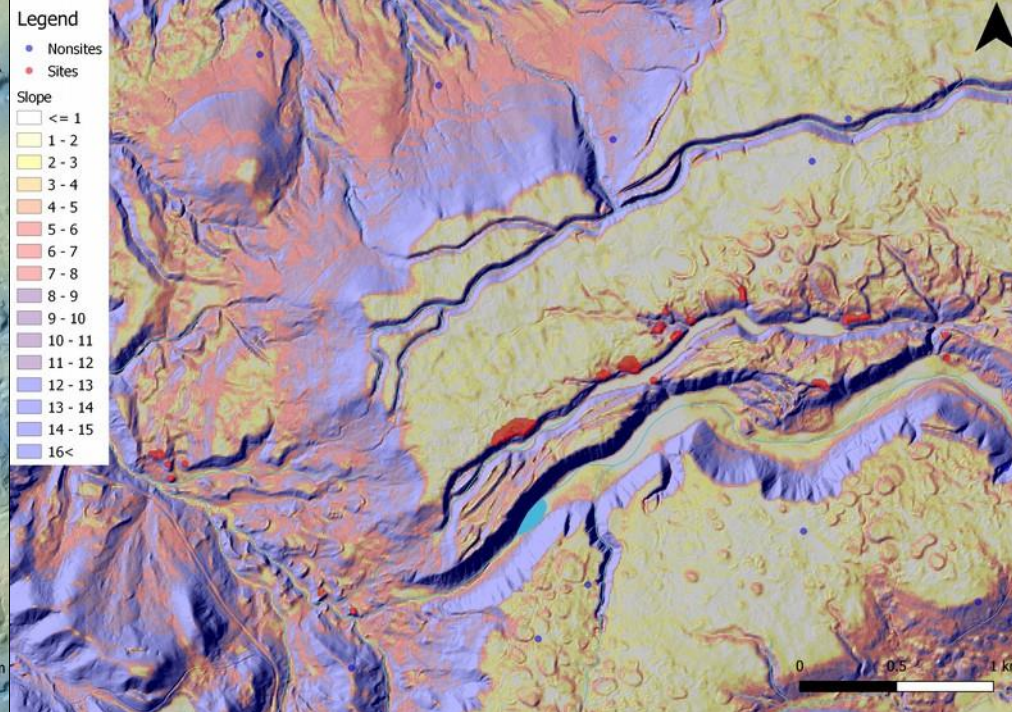
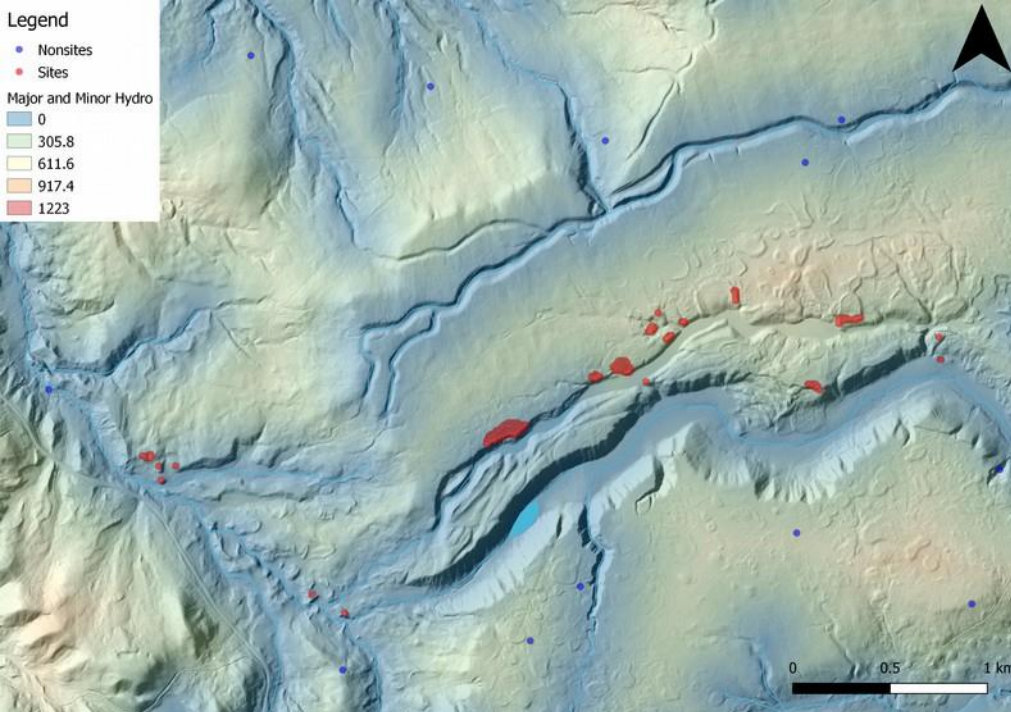
Relationship between Slope and Water Proximity





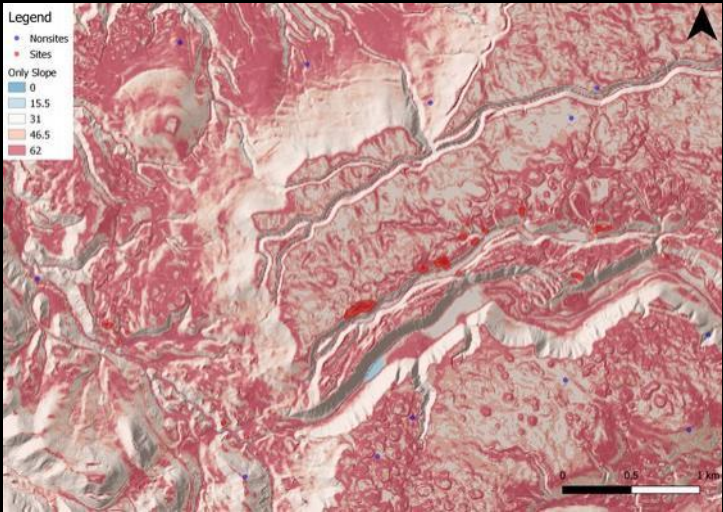
Training and
Testing Inputs
Sites and Nonsites

0 500 1000 m

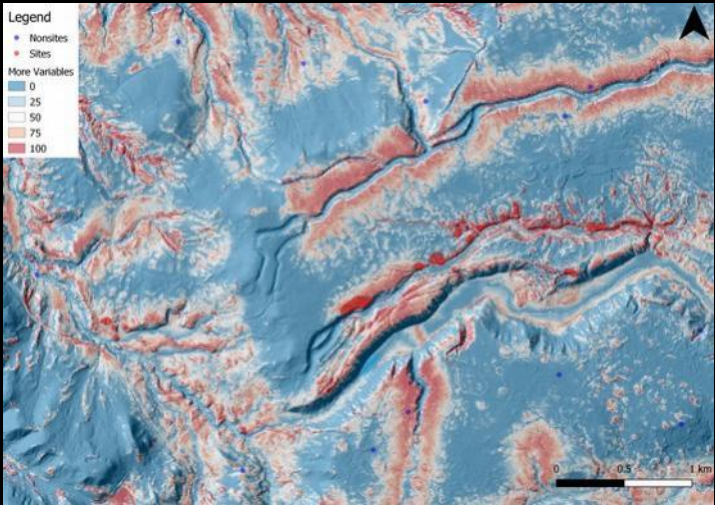


Input Ecological
and
Topographical
Variables

$$Gain = 1 - \left(\frac{\% \text{ Area Predicted as Site-likely}}{\% \text{ Sites in Site-Likely Area}} \right)$$

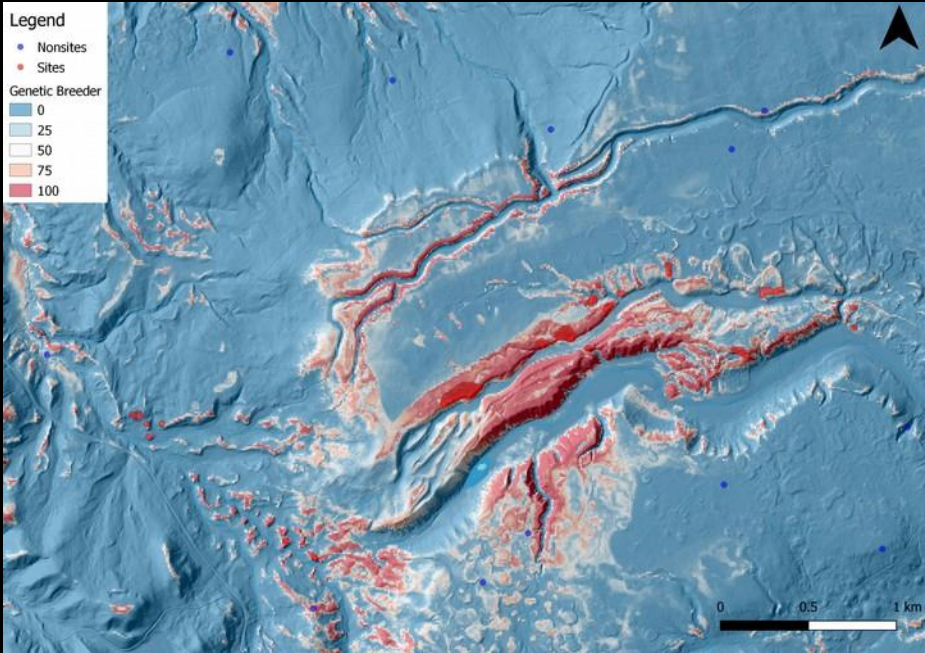


Only Using Slope – 35% Accuracy with 18% coverage



More Variables – 90% Accuracy with 31% coverage

Evaluate
Accuracy and
Coverage



Genetic Breeder – 58% accuracy with 5% coverage

Genetic Breeder

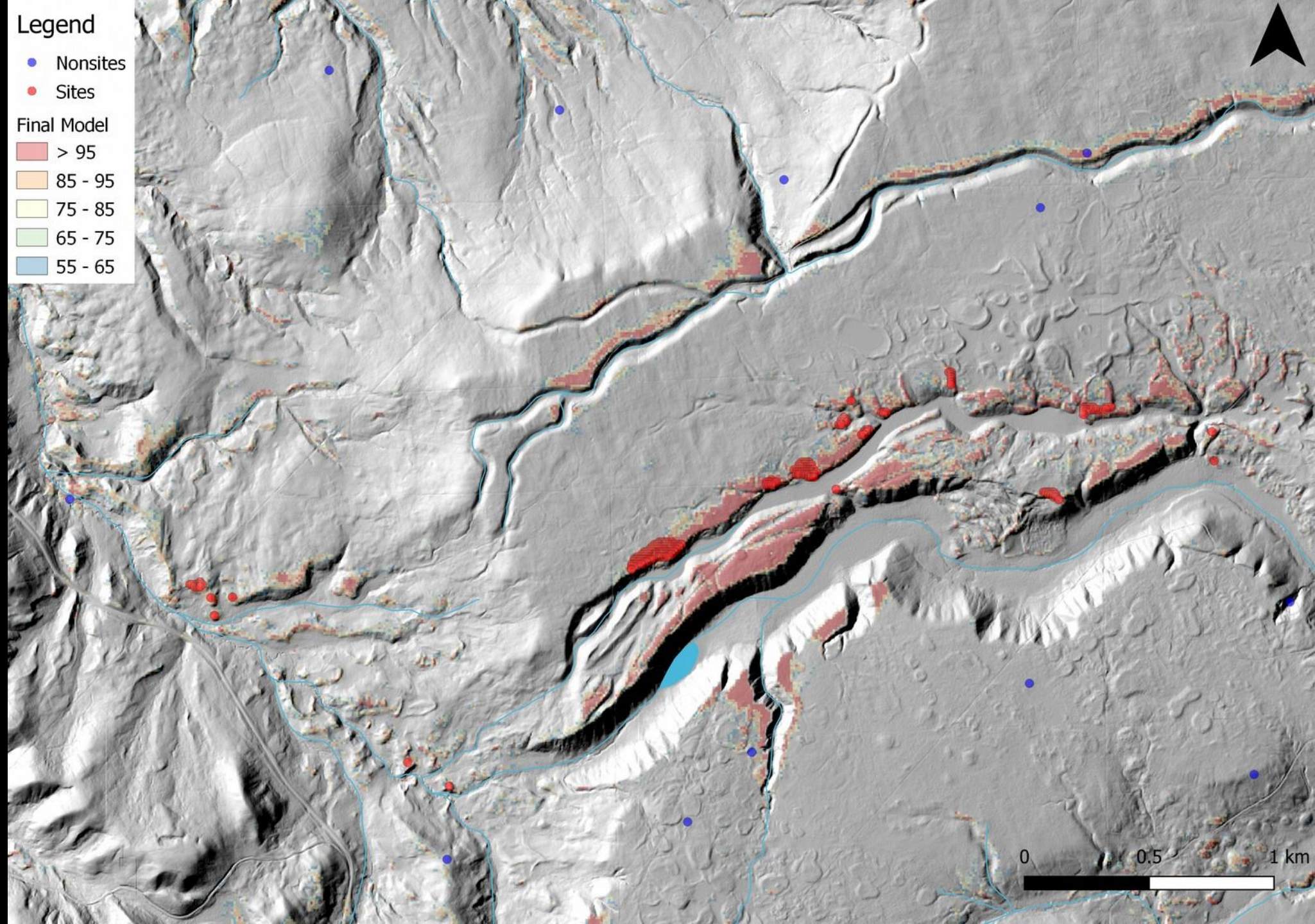
Legend

- Nonsites
- Sites

Final Model

- > 95
- 85 - 95
- 75 - 85
- 65 - 75
- 55 - 65

Final Model
Output - 89%
accuracy with 4%
coverage.



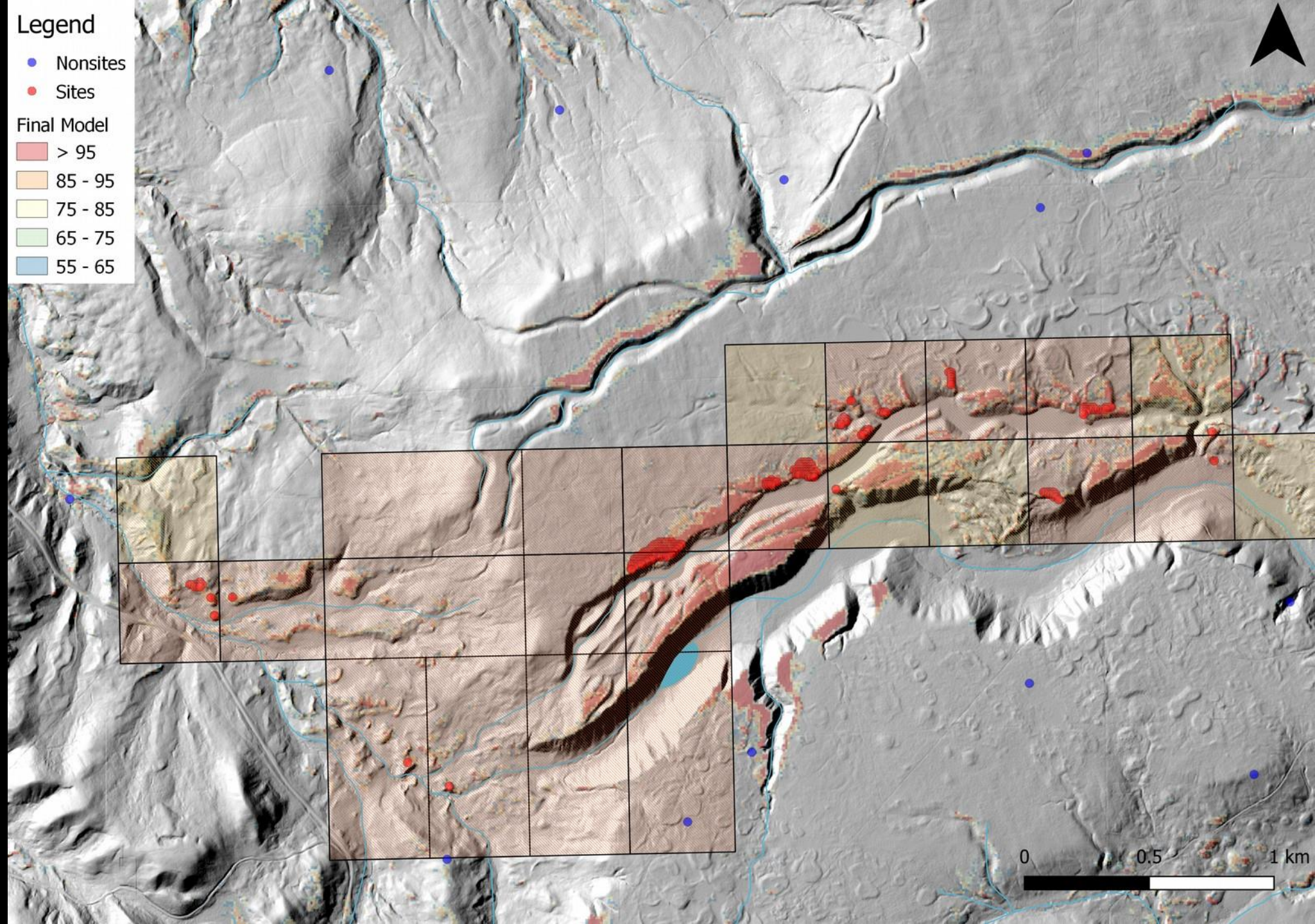
Legend

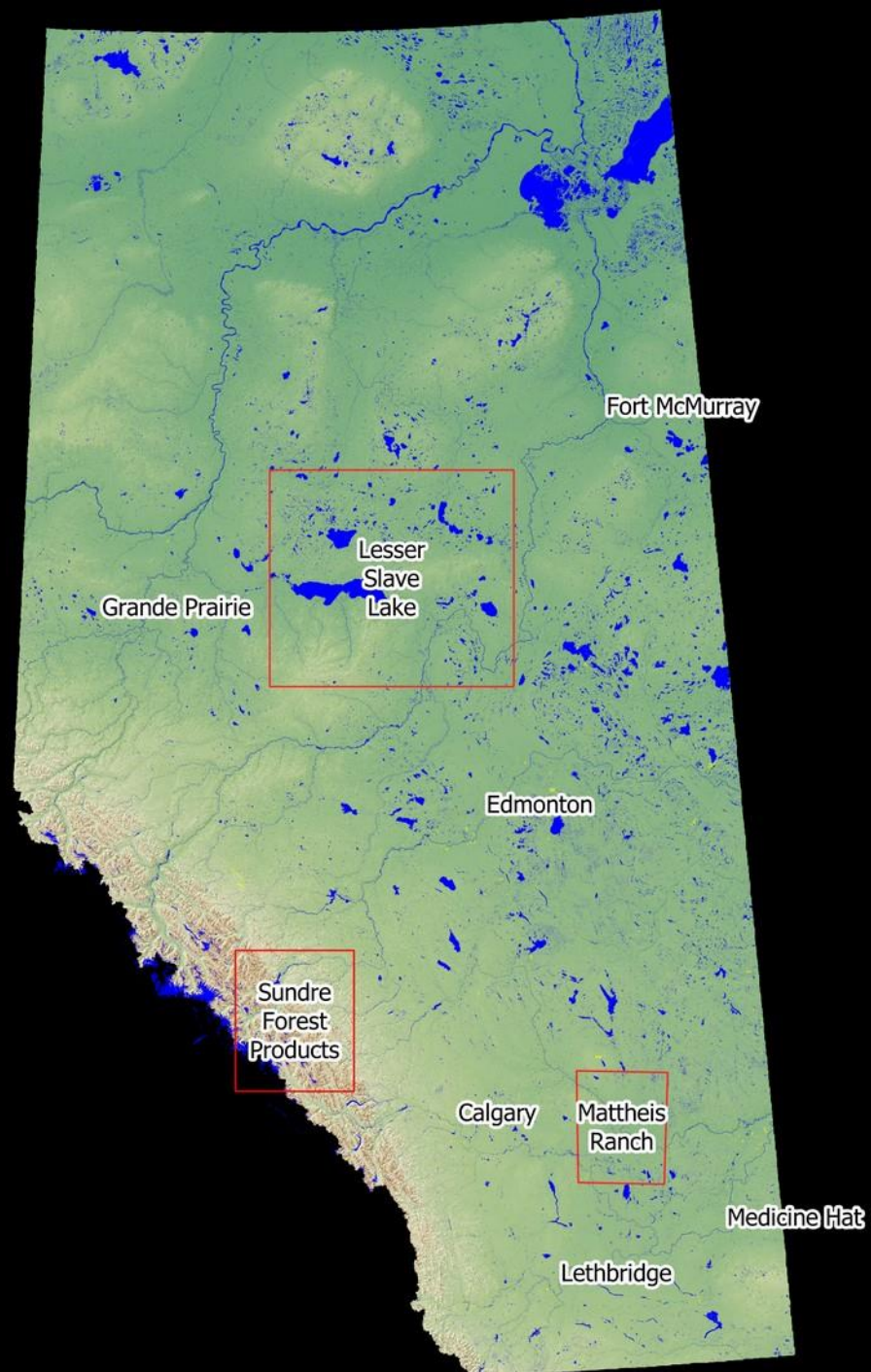
- Nonsites
- Sites

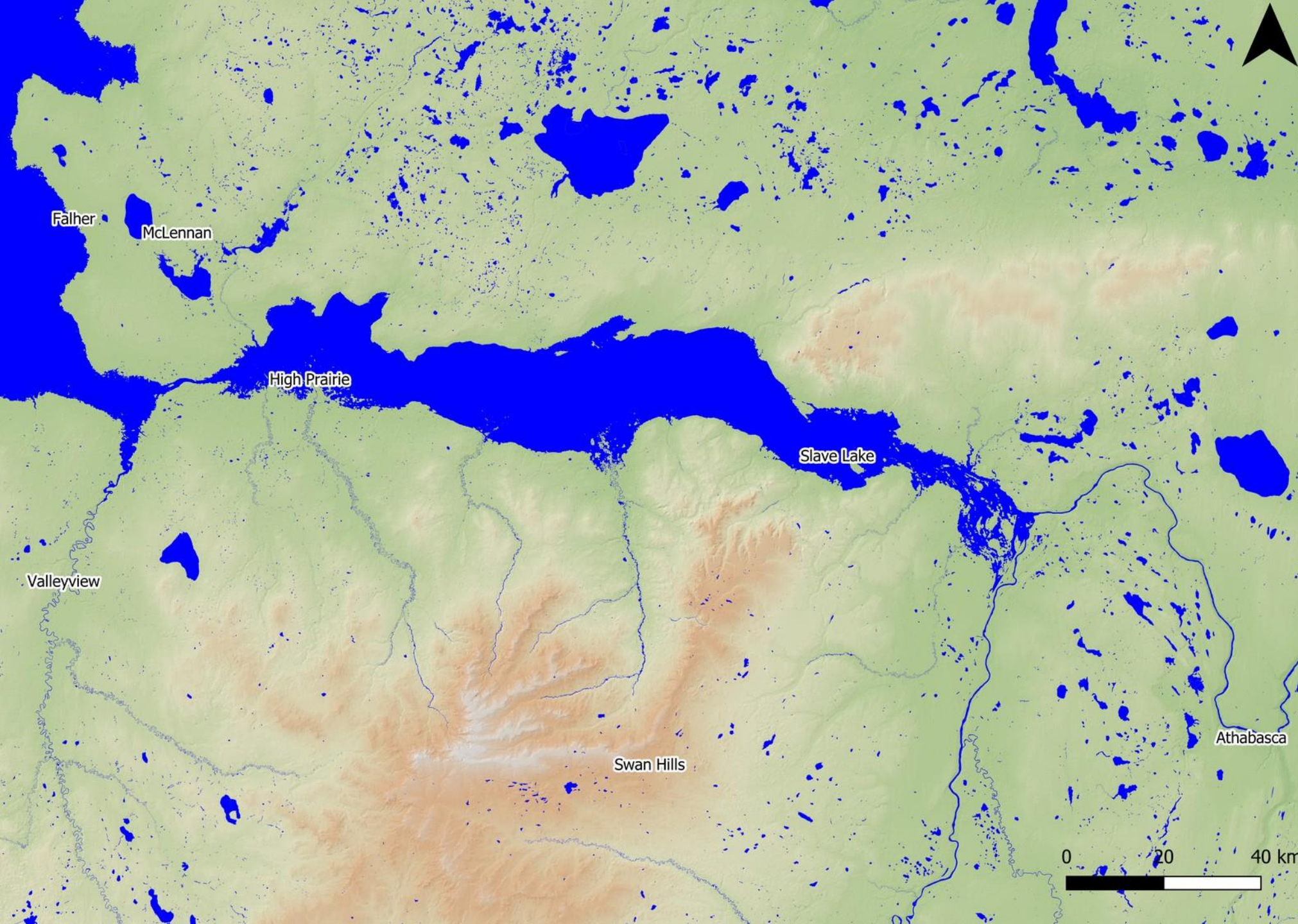
Final Model

- > 95
- 85 - 95
- 75 - 85
- 65 - 75
- 55 - 65

Final Model
Output – 89%
accuracy with 4%
coverage.

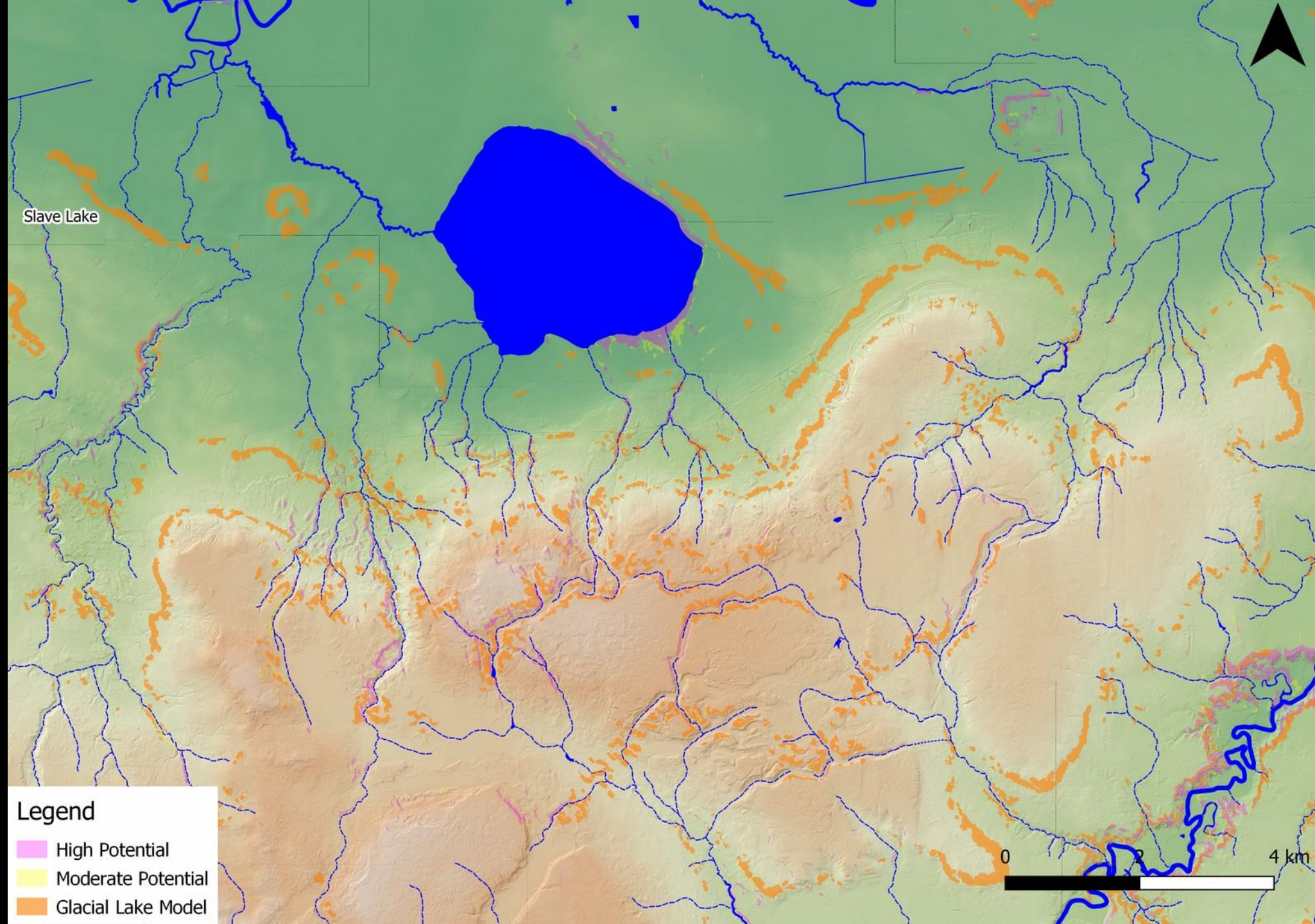


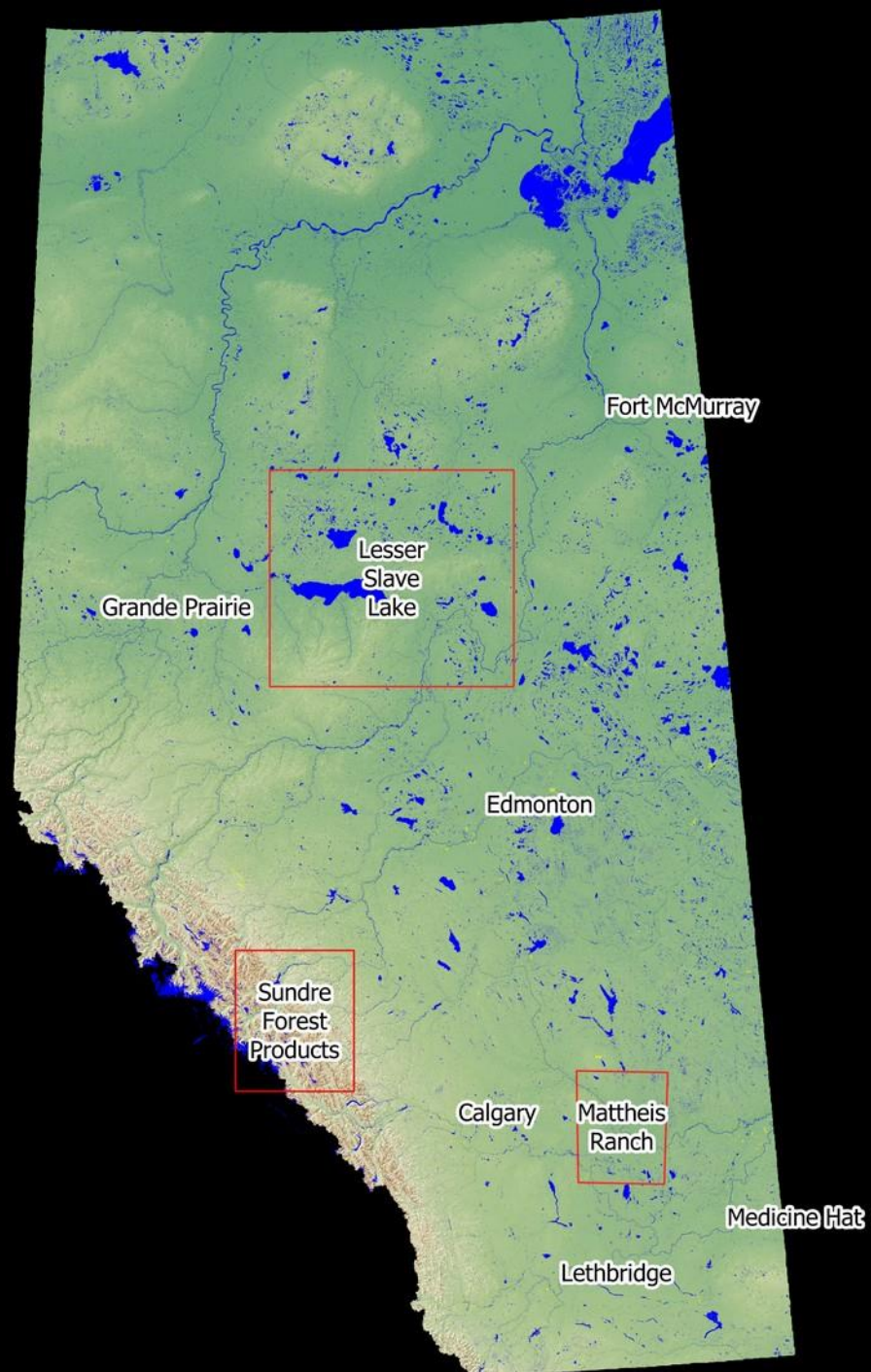


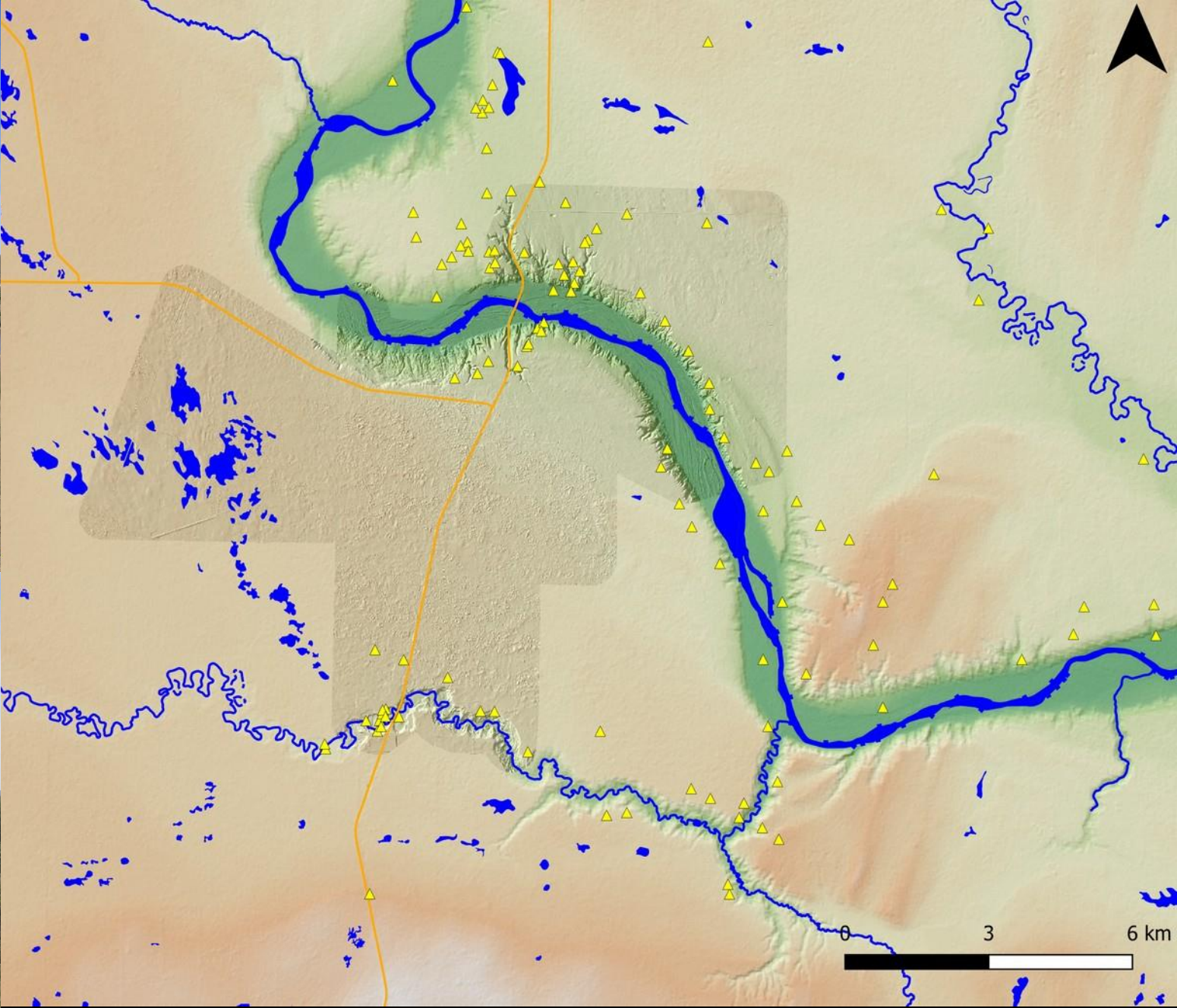


Indian Creek Phase
End of the Ice Age
11,000 years ago
Lesser Slave Lake is
25 m higher than
today

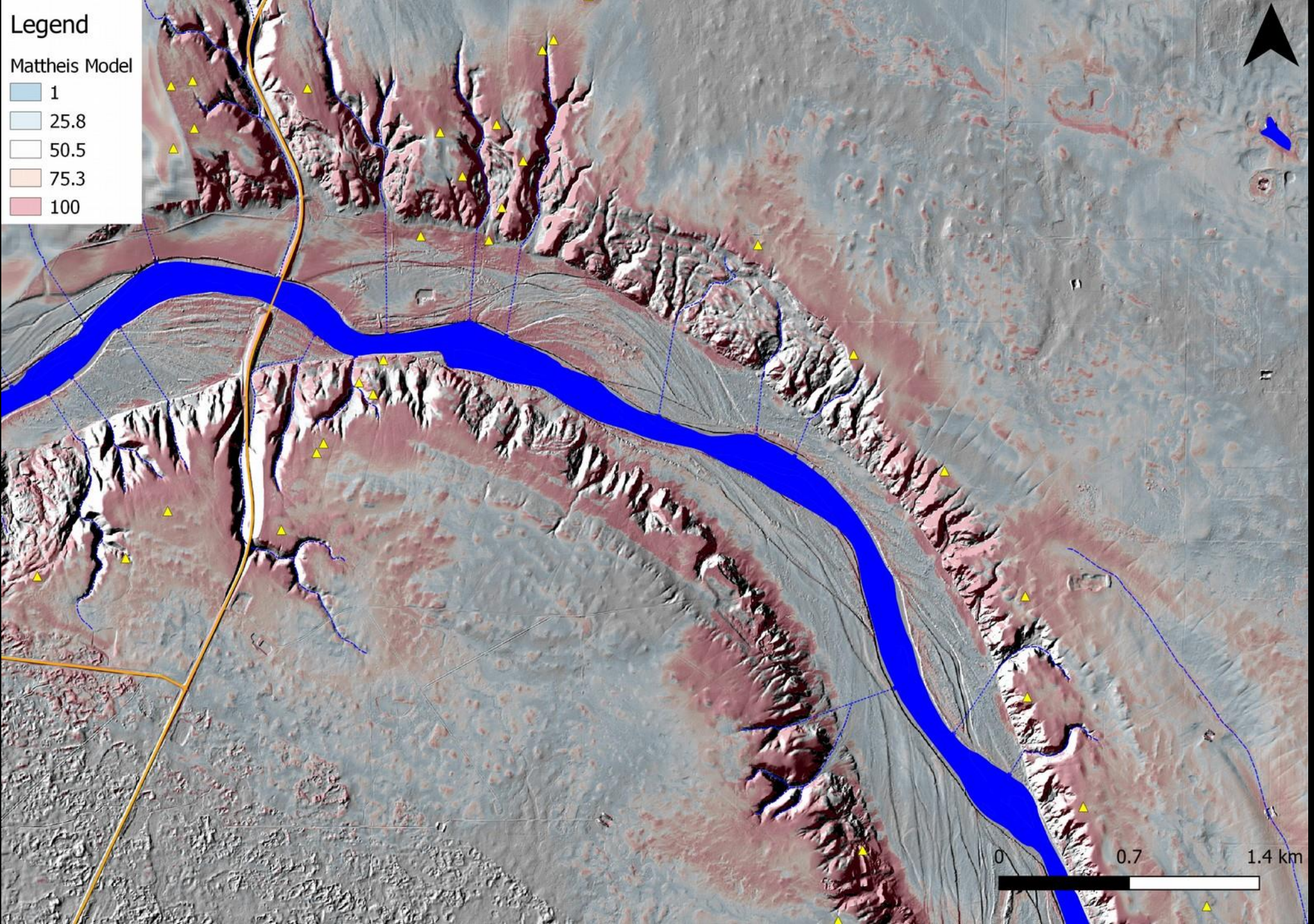
GSLAKE Model
Mitsue Lake
East of Slave Lake







Mattheis Research Ranch -Dutchness, AB



Mattheis Model V1

Conclusion

- Machine Learning in Archaeology
 - Effective, Accurate, Precise
 - Identify New Patterns
 - Scientifically Valid
- Tool for Risk Management
 - User Friendly End Product
 - Universal
 - Customization



Learn More

- Alberta Culture & Tourism
 - www.alberta.ca/archaeology.aspx
- Archaeological Society of Alberta
 - www.arkyalberta.com/
- Tree Time Services
 - Blog: archaeologyblog.treetimeservices.ca
 - Facebook: facebook.com/TreeTimeArchaeology/
 - Regulatory update newsletter: email archaeology@treetime.ca to subscribe