Developing a Forest Loss Model for Roraima, Brazil

GEOG 260 Final Presentation

Andrew Niehaus, Tanner Honnef, Annabel Krugman, Will Verde, and Sophie Hayes

CLARK UNIVERSITY

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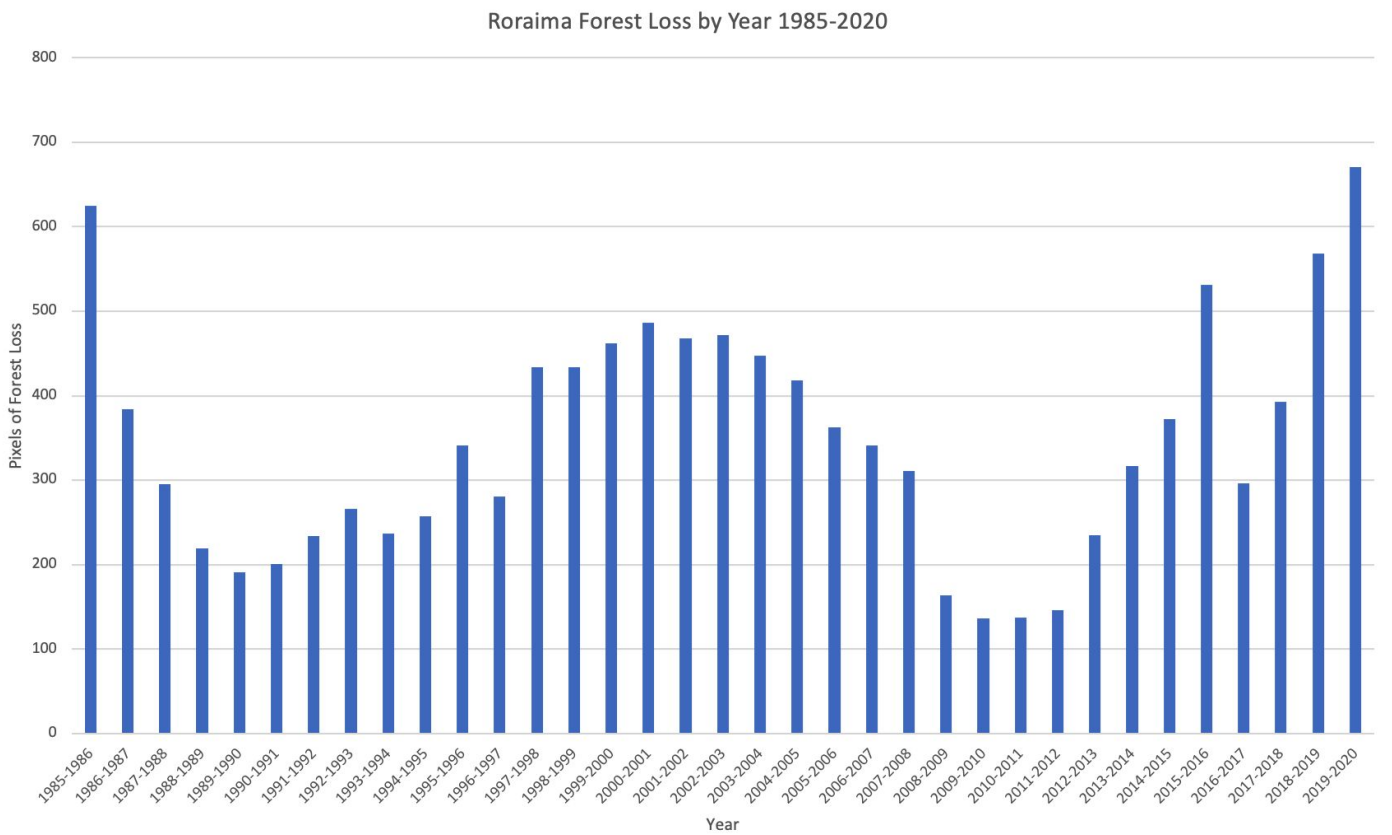
Introduction

In this project we observed differences in GEOMOD outputs as changes were implemented in validation period length and driver variables. This analysis displayed an increase in Figure of Merit as validation period length increased and number of driver variables increased.

Forest Loss by Year 1985-2020 in Roraima



Overview of GEOMOD Run Collections

Validation Interval 4	2000-2002 - 2 years
Validation Interval 3	2000-2005 - 5 years
Validation Interval 2	2000-2010 - 10 years
Validation Interval 1	2000-2015 - 15 years

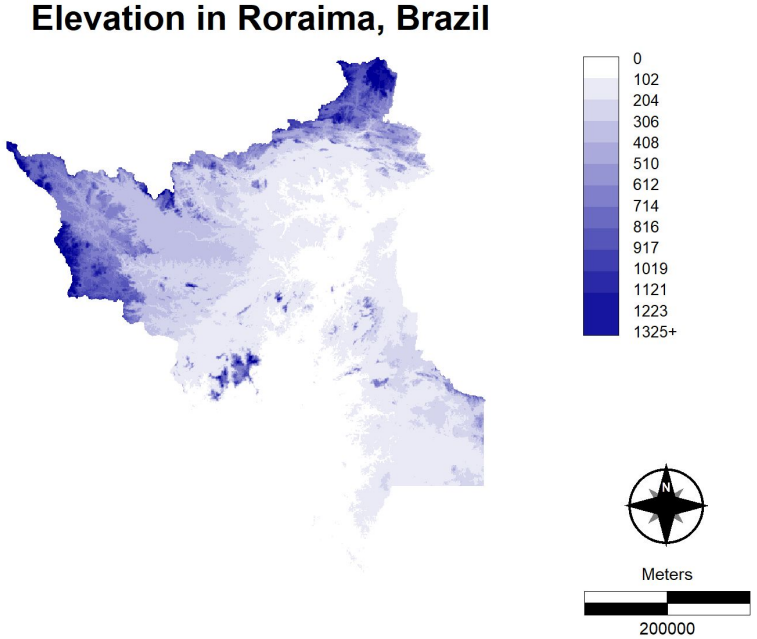
Collection A	Elevation Driver Only
Collection B	Elevation and Slope Drivers
Collection C	Slope, Elevation, Indigenous Land, Protection Status, Land Cover, Rivers, and Population Density Drivers

Remember: The number of driver variables used in GEOMOD increases with each collection after the control group

GEOMOD Run Collection A: Elevation

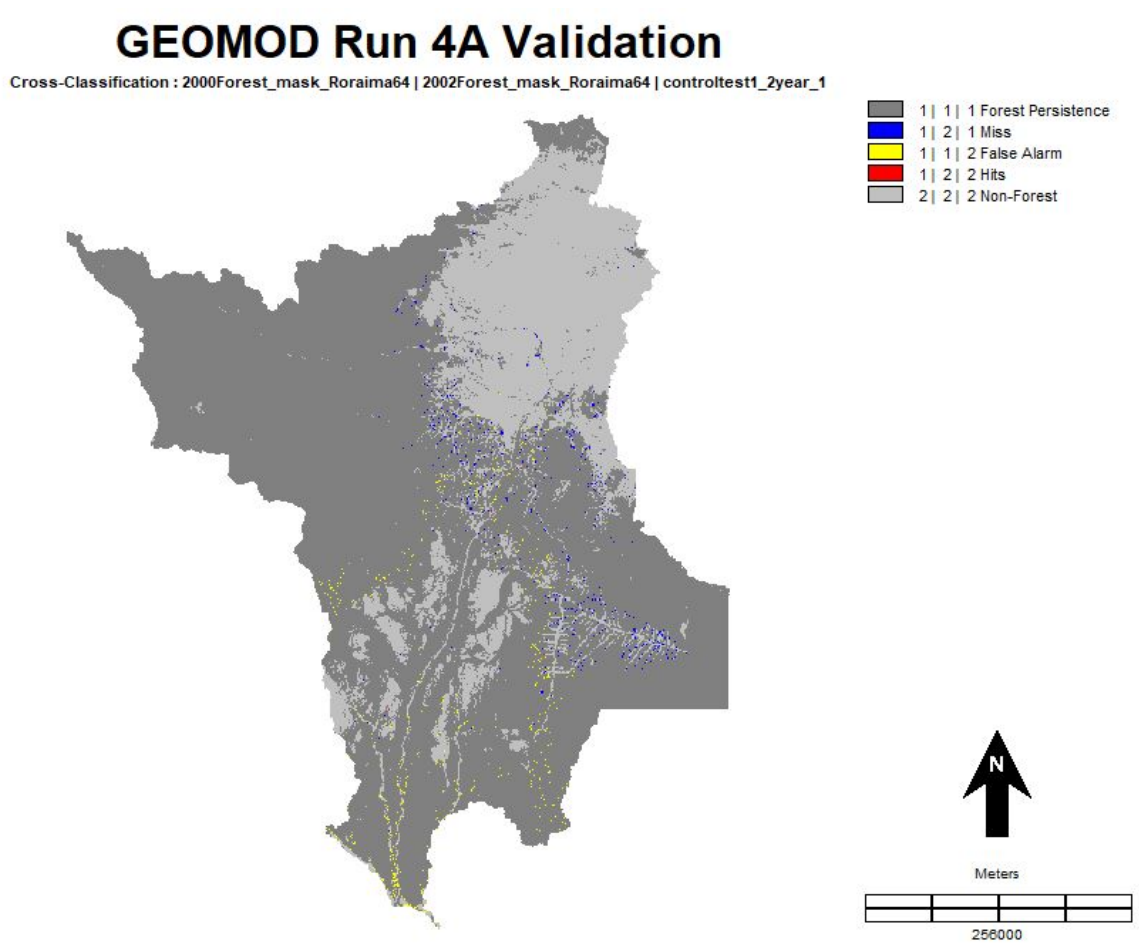
Interval Length 2, 5, 10, 15 years

This run collection serves as a control group to the larger study of the effect of validation length on GEOMOD results



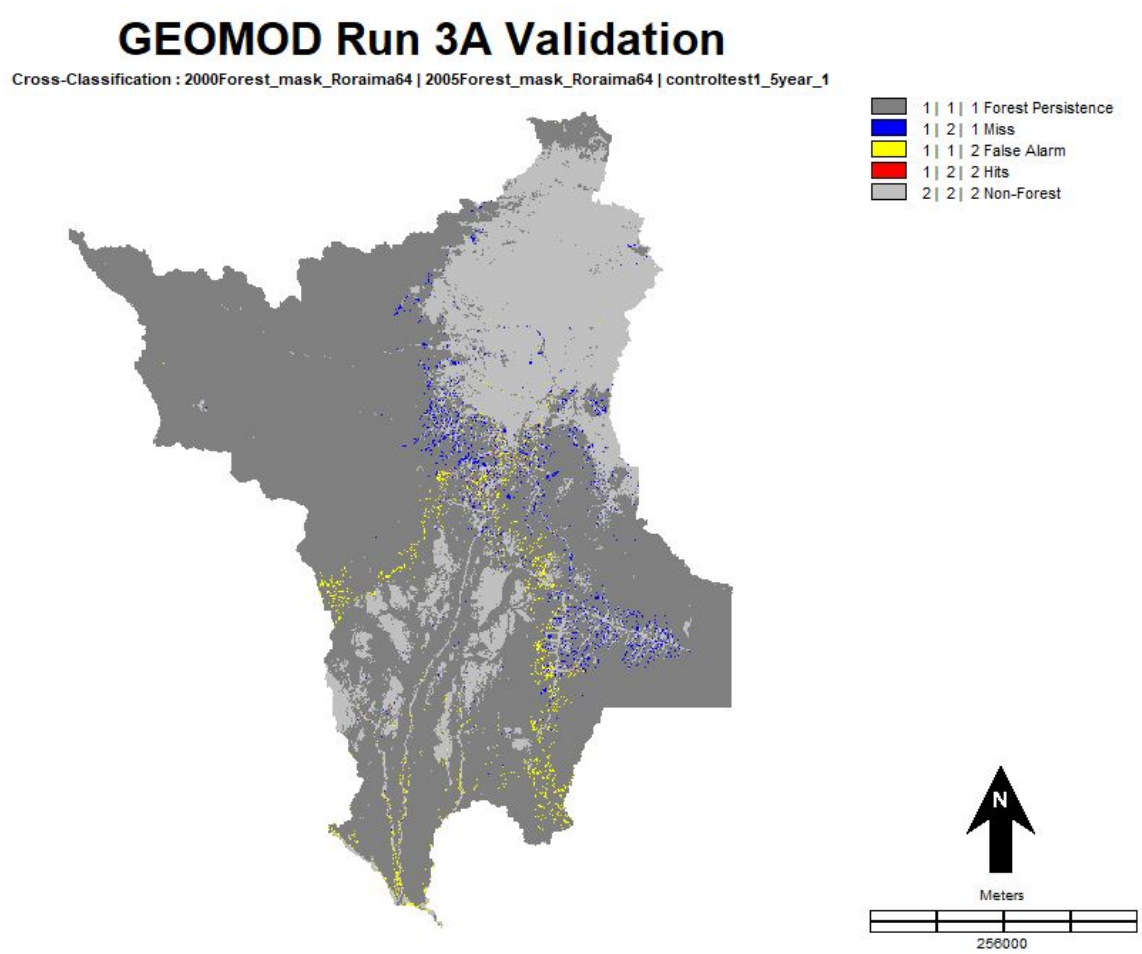
Run 4A - 2 Year Validation - Elevation

Hits	9
Misses	945
False Alarms	945
FOM	0.474



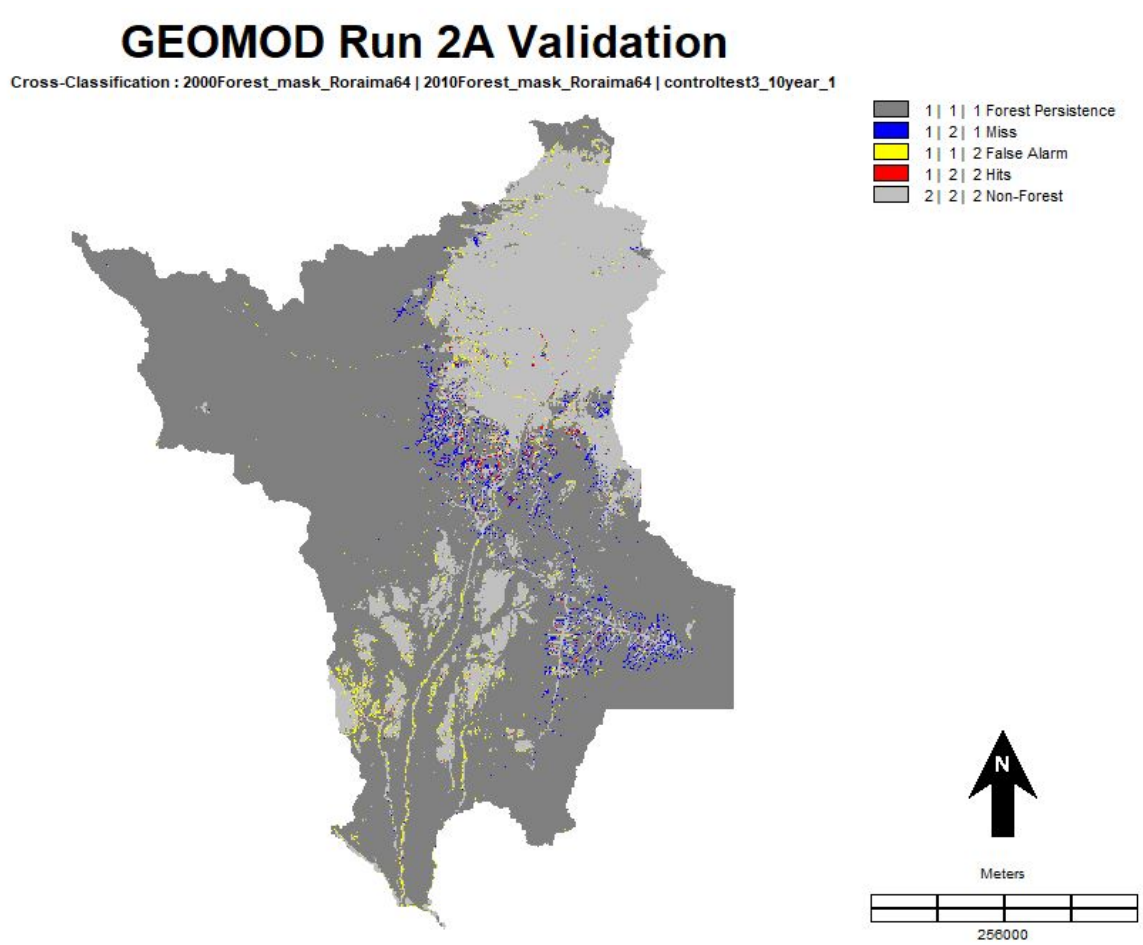
Run 3A - 5 Year Validation - Elevation

Hits	59
Misses	2232
False Alarms	2232
FOM	1.304



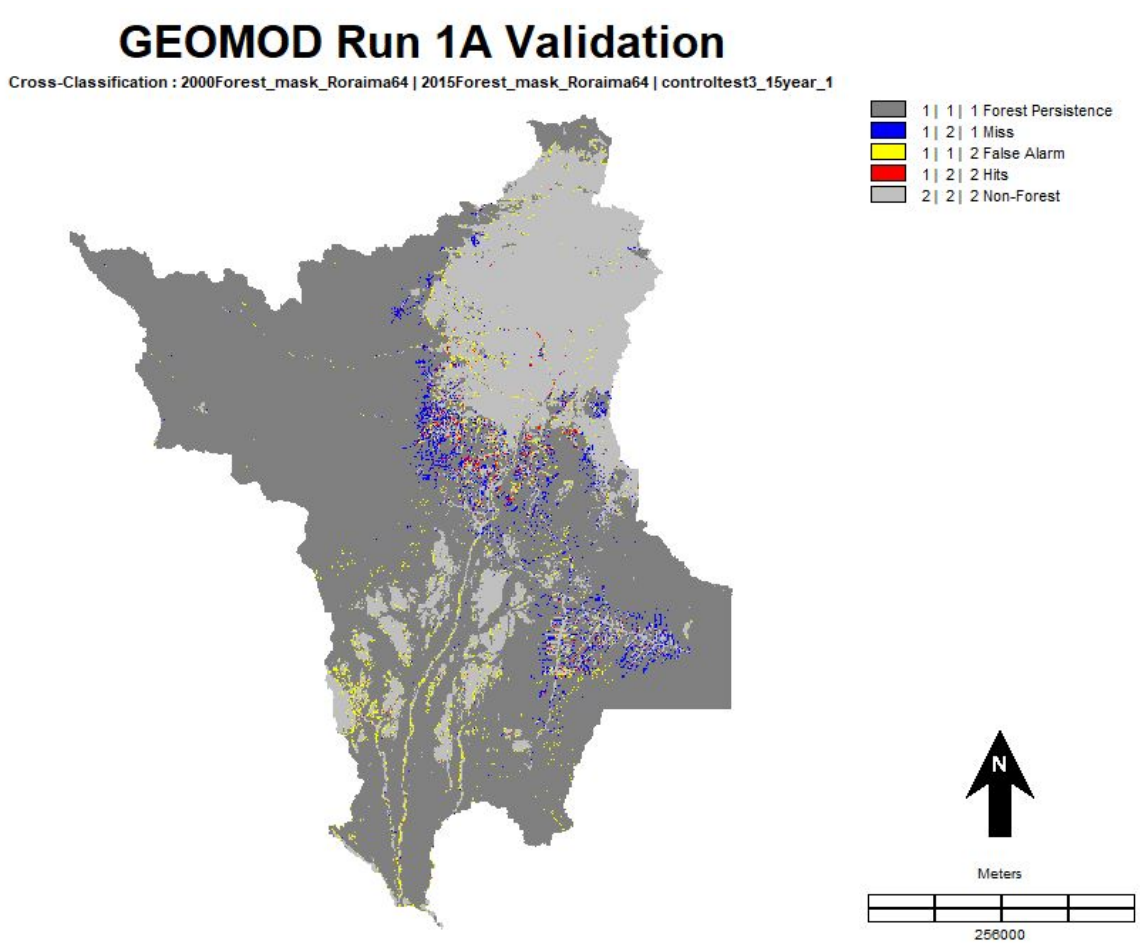
Run 2A - 10 Year Validation - Elevation

Hits	232
Misses	3373
False Alarms	3373
FOM	3.325



Run 1A - 15 Year Validation - Elevation

Hits	431
Misses	4381
False Alarms	4381
FOM	4.688

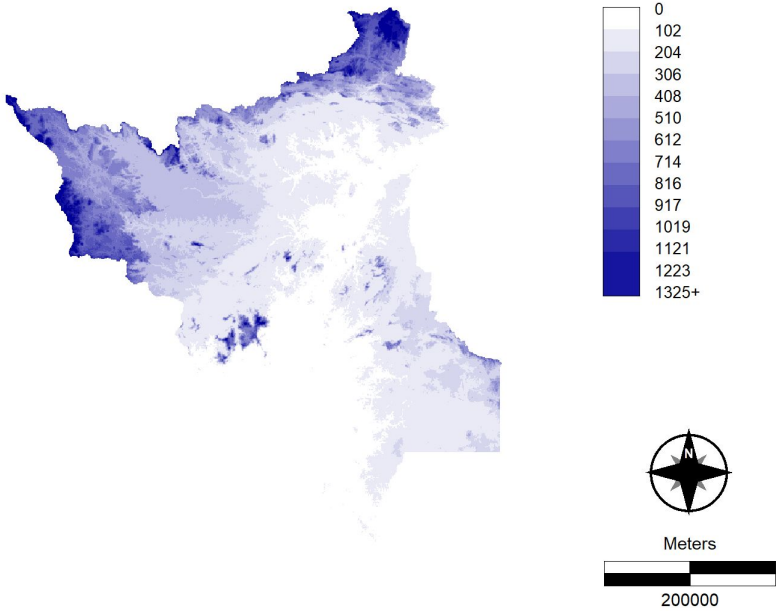


GEOMOD Run Collection B: Elevation and Slope

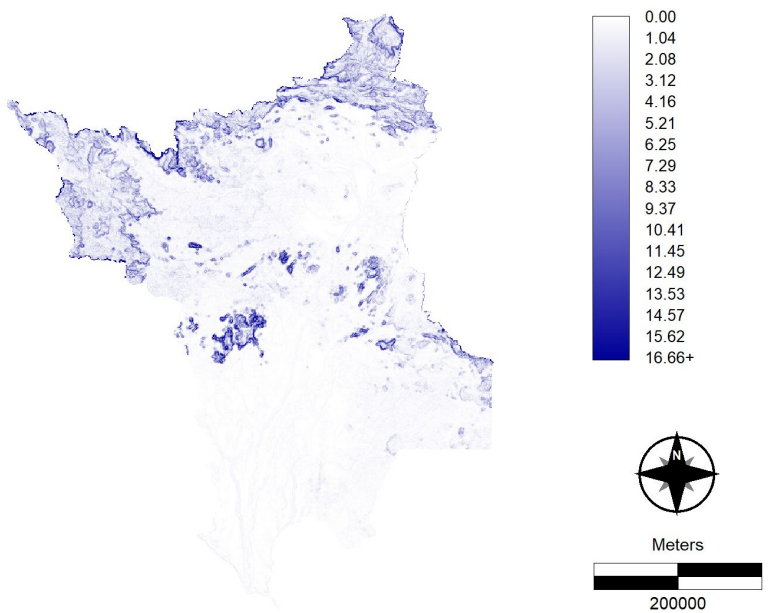
Interval Length: 2,5,10,15 years

Drivers are weighted equally

Elevation in Roraima, Brazil

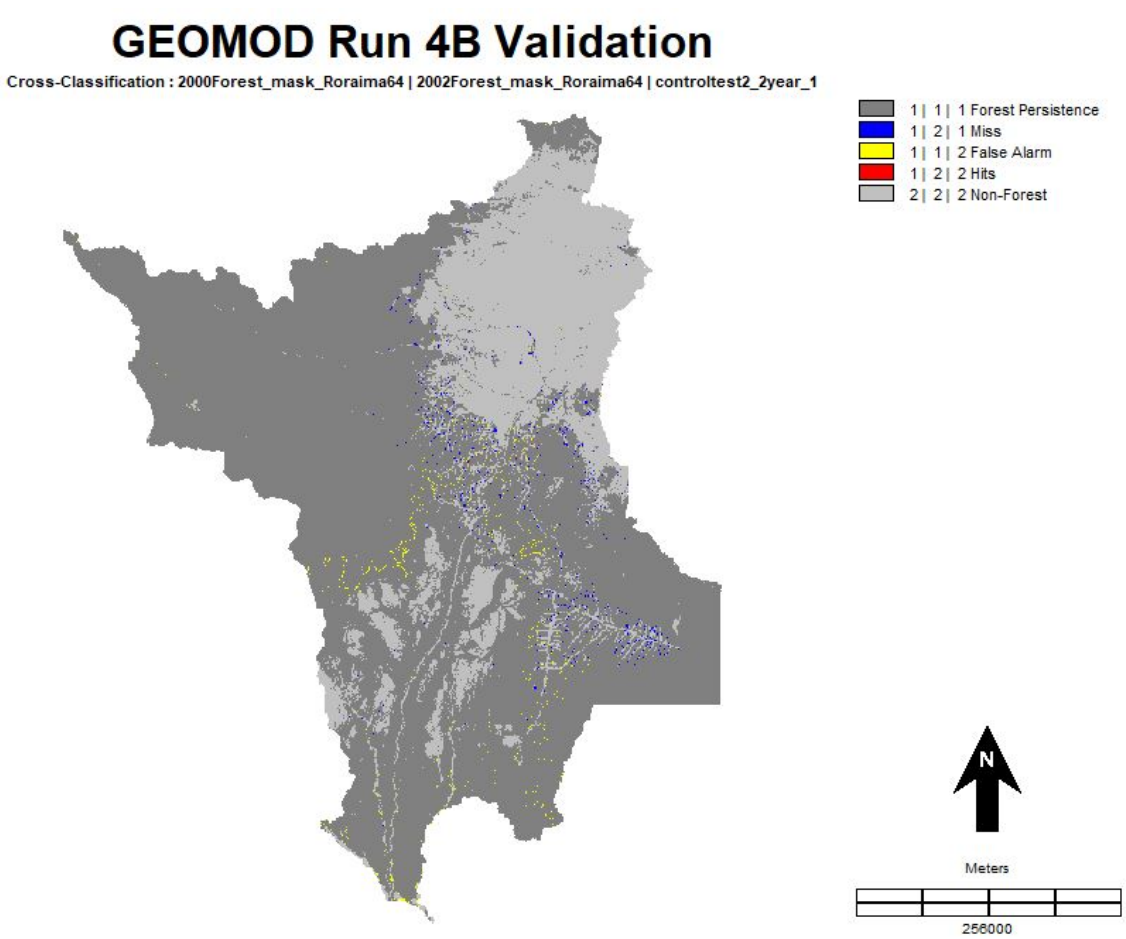


Slope in Roraima, Brazil



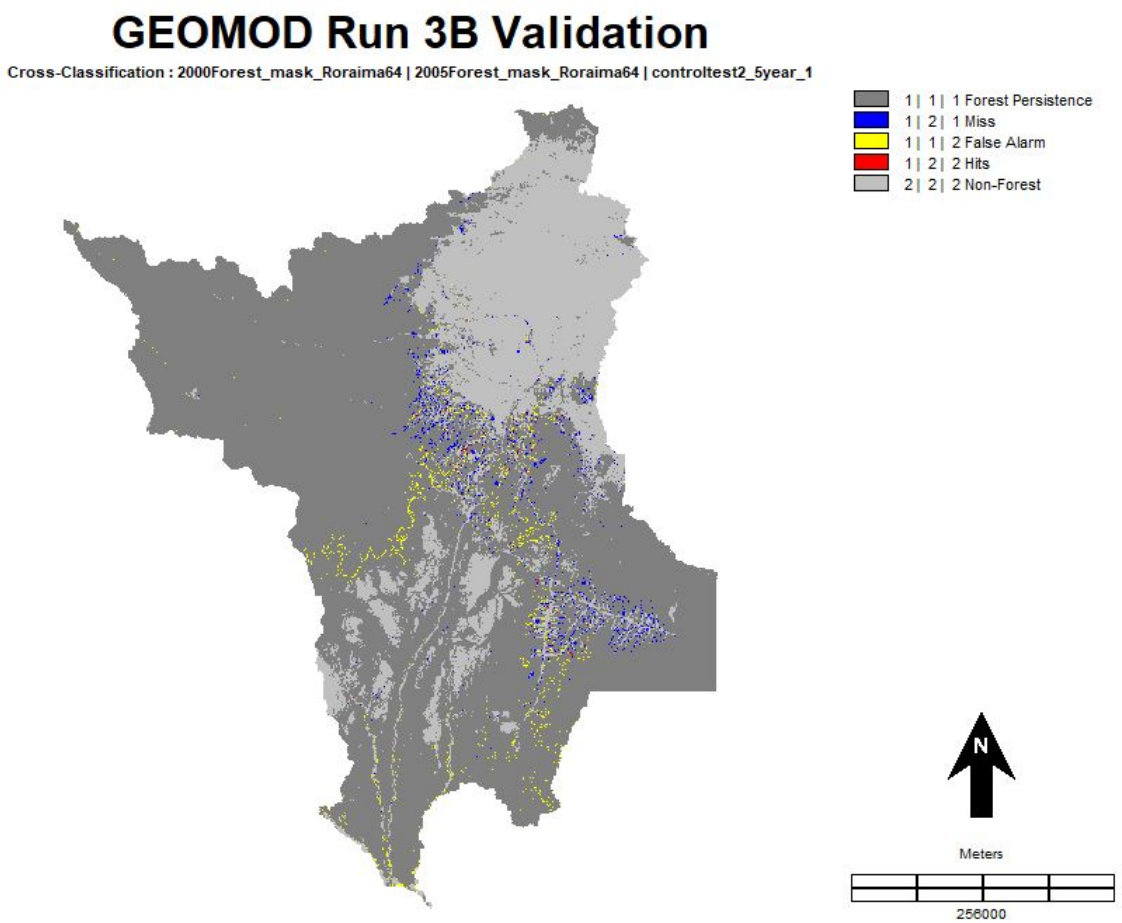
Run 4B - 2 Year Validation - Elevation and Slope

Hits	12
Misses	942
False Alarms	942
FOM	0.633



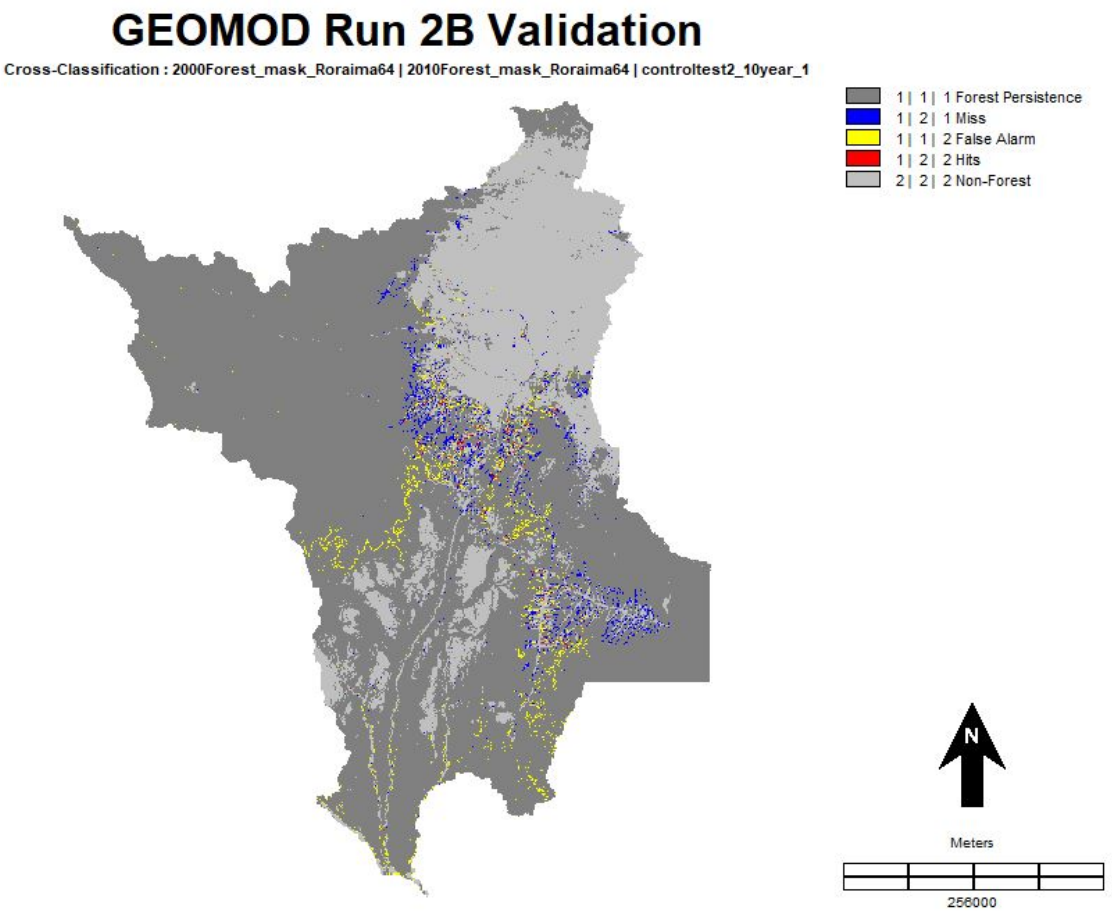
Run 3B - 5 Year Validation - Elevation and Slope Drivers

Hits	118
Misses	2173
False Alarms	2173
FOM	2.643



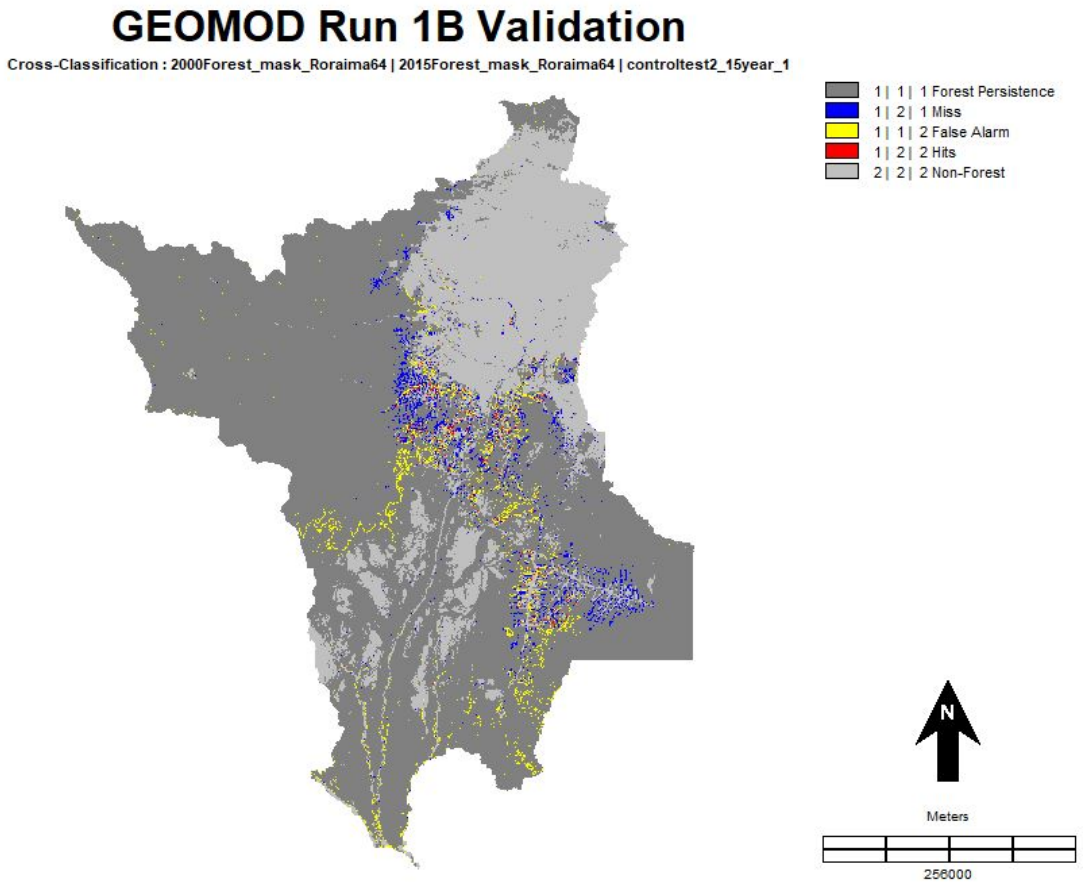
Run 2B - 10 Year Validation - Elevation and Slope Drivers

Hits	324
Misses	3281
False Alarms	3281
FOM	4.705



Run 1B - 15 Year Validation - Elevation and Slope Drivers

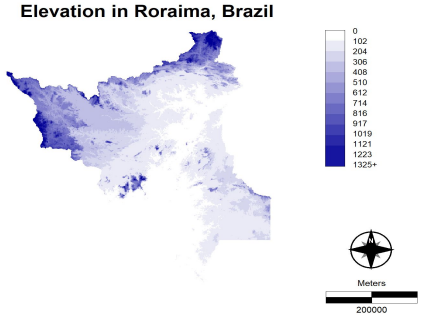
Hits	552
Misses	4260
False Alarms	4260
FOM	6.085

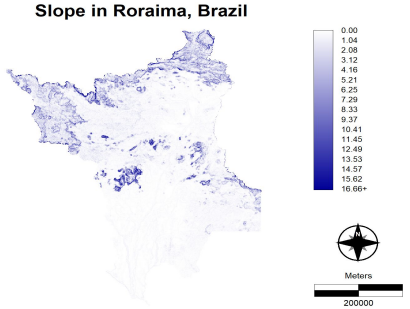


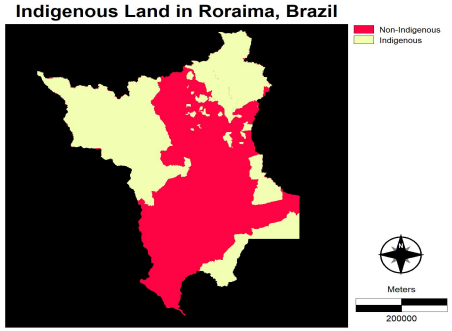
GEOMOD Run Collection C: Slope, Elevation, Indigenous Land, Protection Status, Land Cover, Rivers, Population Density

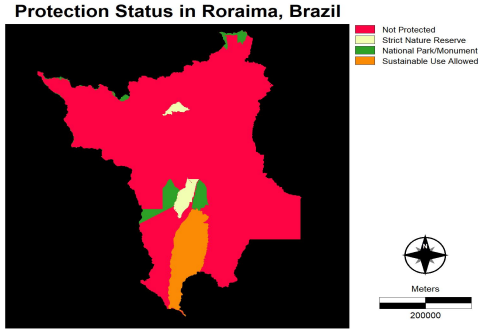
Interval Length: 2,5,10,15 years

Drivers are weighted equally







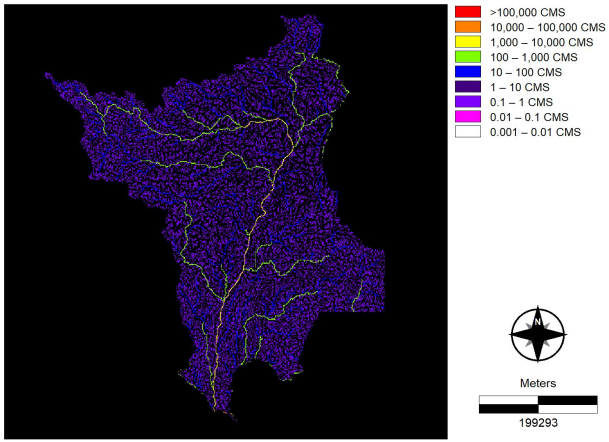


GEOMOD Run Collection C: Slope, Elevation, Indigenous Land, Protection Status, Land Cover, Rivers, Population Density

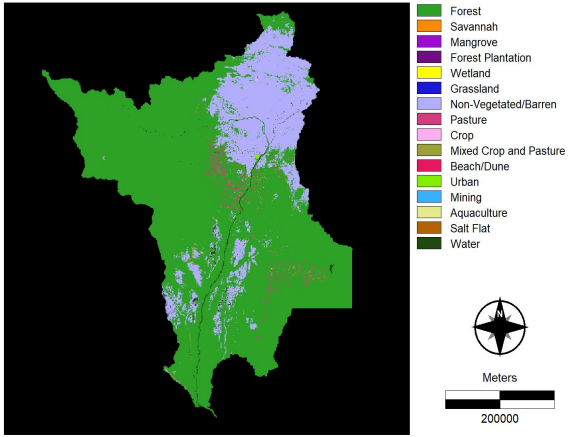
Interval Length: 2,5,10,15 years

Drivers are weighted equally

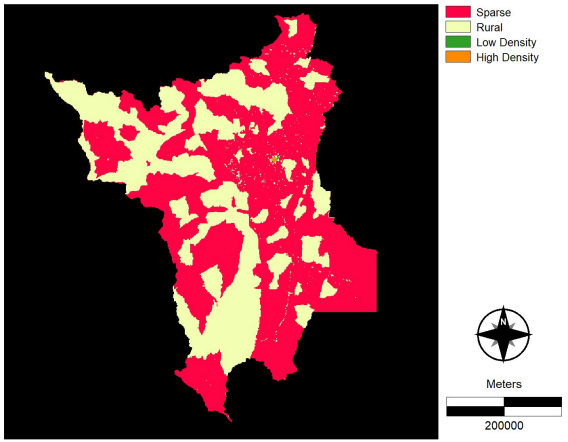
Rivers in Roraima, Brazil



Land Cover in Roraima, Brazil

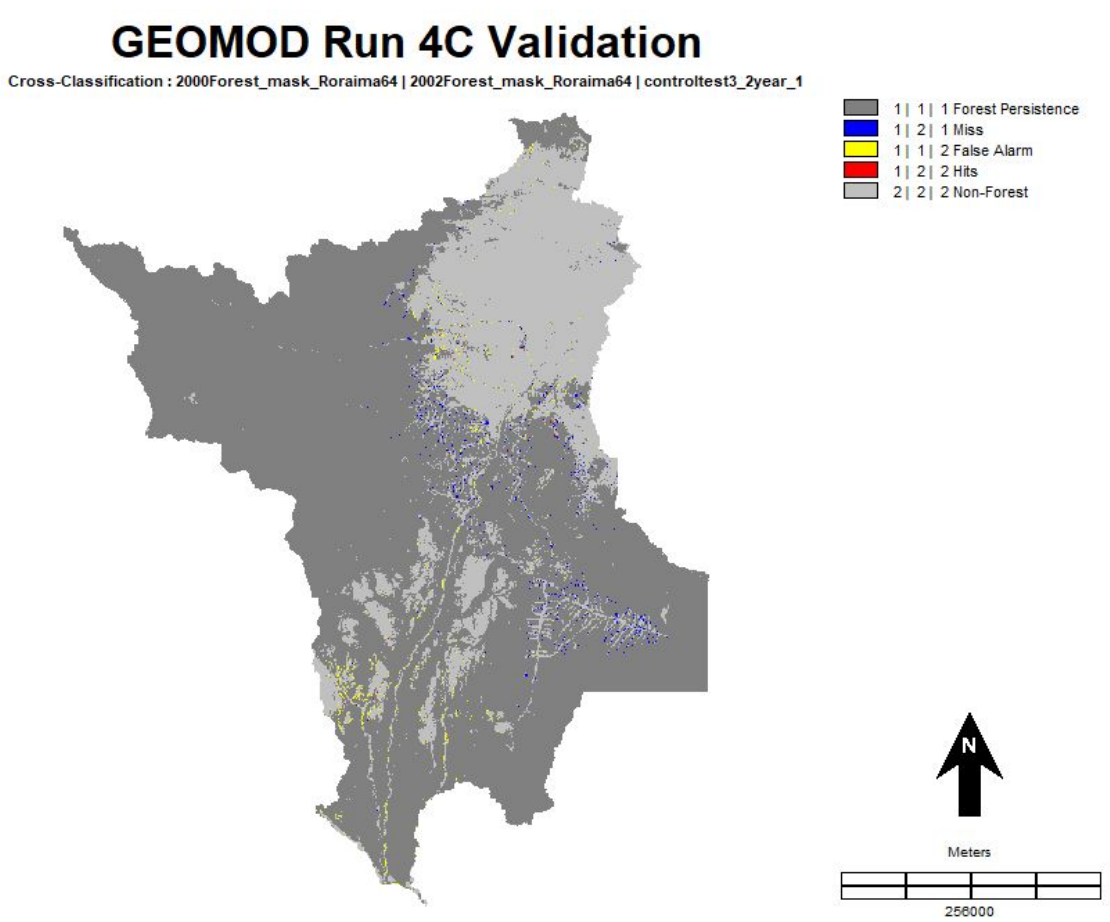


Population Density in Roraima, Brazil



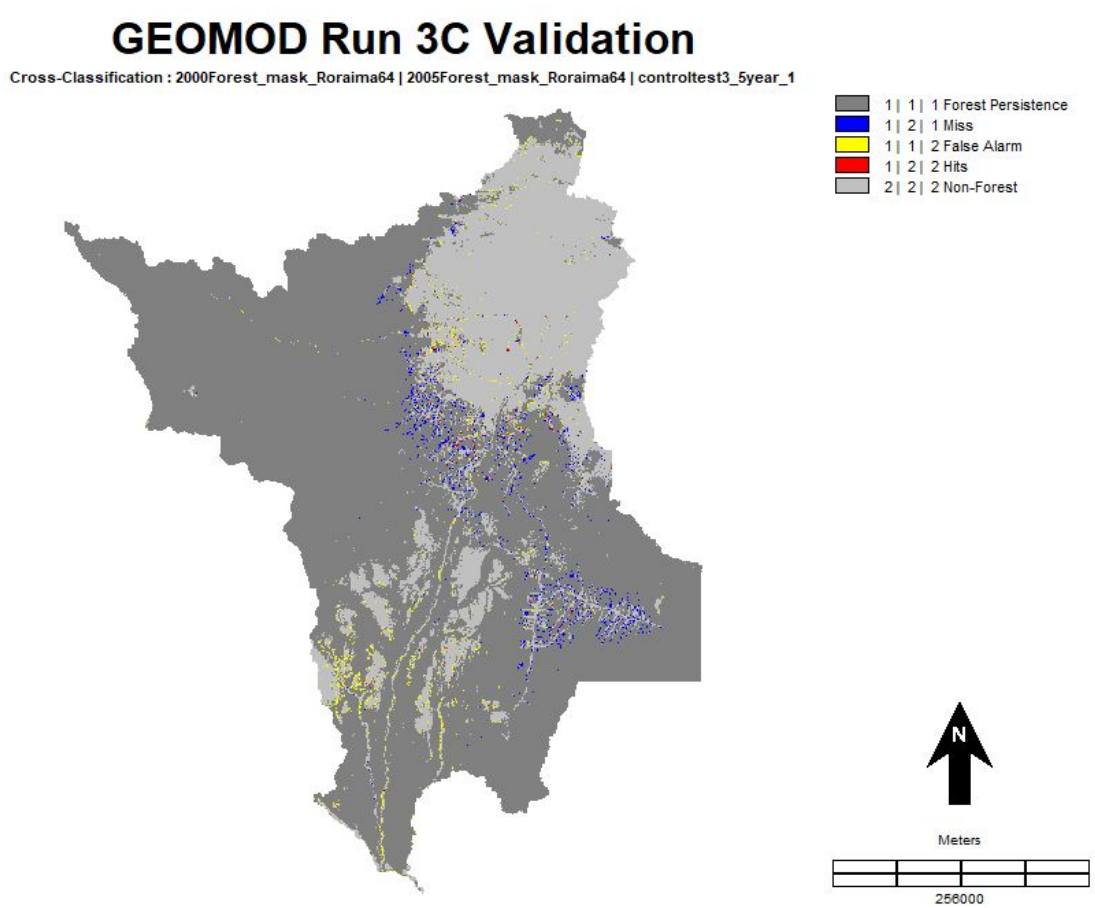
Run 4C - 2 Year Validation - Multiple Drivers

Hits	34
Misses	920
False Alarms	920
FOM	1.814



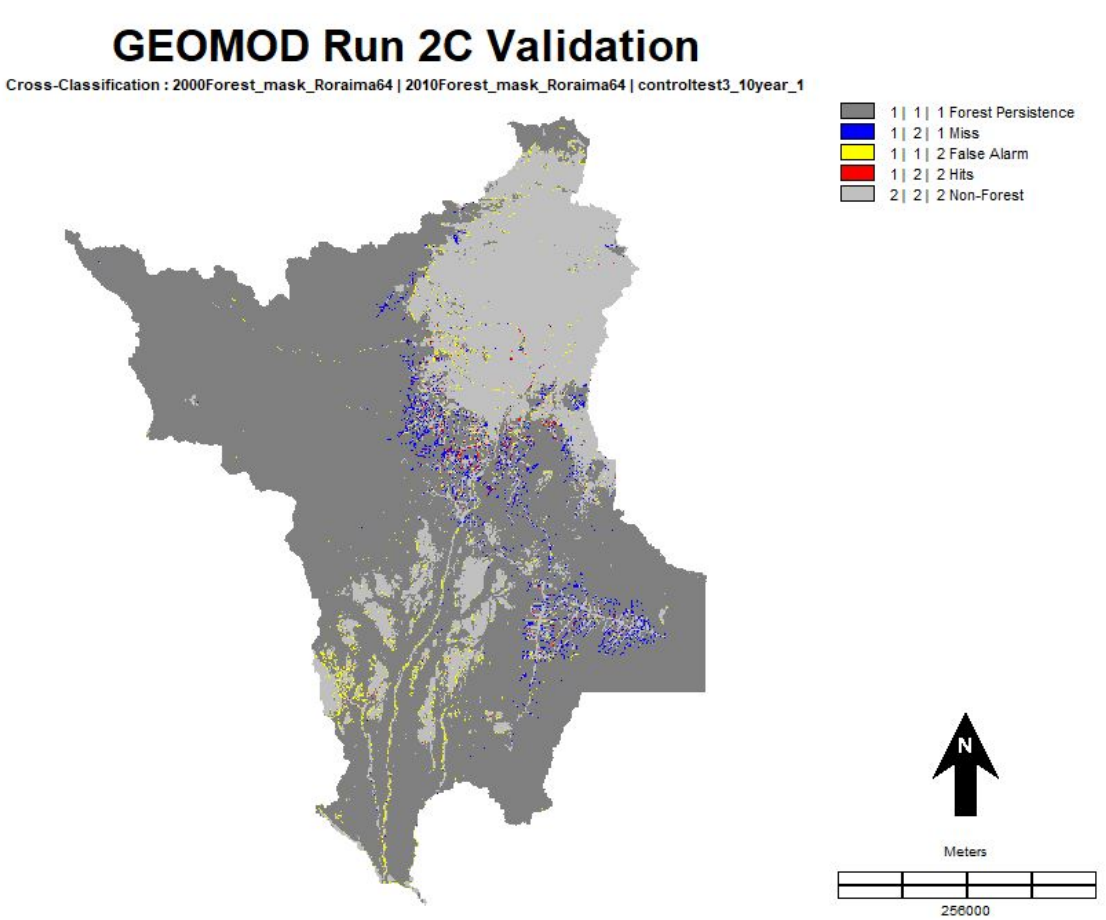
Run 3C - 5 Year Validation - Multiple Drivers

Hits	206
Misses	2085
False Alarms	2085
FOM	4.707



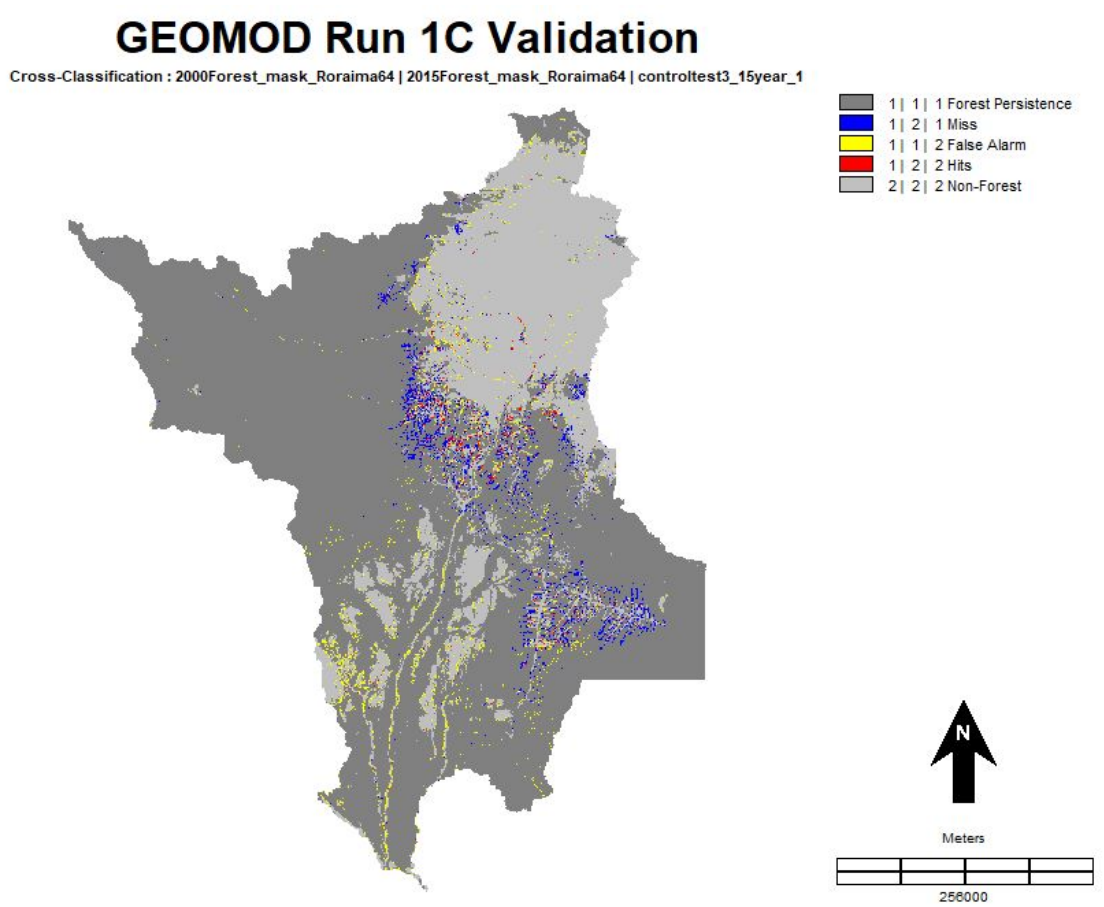
Run 2C - 10 Year Validation - Multiple Drivers

Hits	583
Misses	3022
False Alarms	3022
FOM	8.797

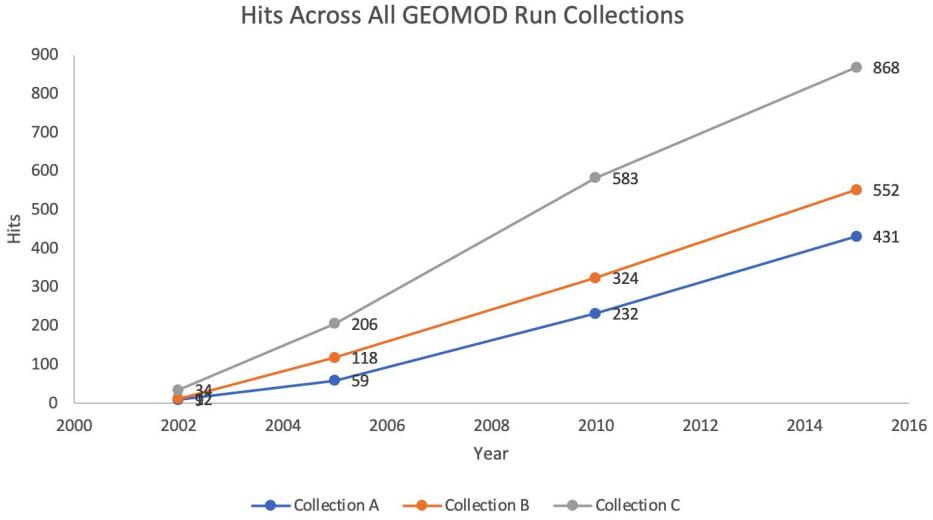


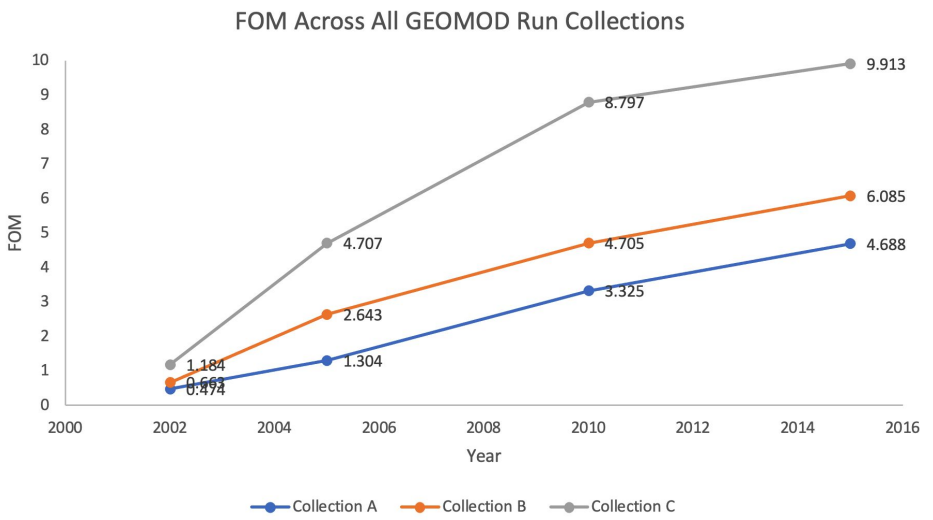
Run 1C - 15 Year Validation - Multiple Drivers

Hits	868
Misses	3944
False Alarms	3944
FOM	9.913



Comparison of all GEOMOD Run Collections





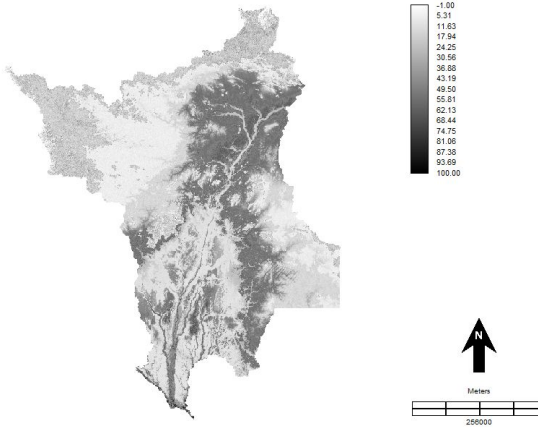
Collection A	Elevation Driver Only
Collection B	Elevation and Slope Drivers
Collection C	Slope, Elevation, Indigenous Land, Protection Status, Land Cover, Rivers, and Population Density Drivers

Comparing Suitability Across Collections A, B, C

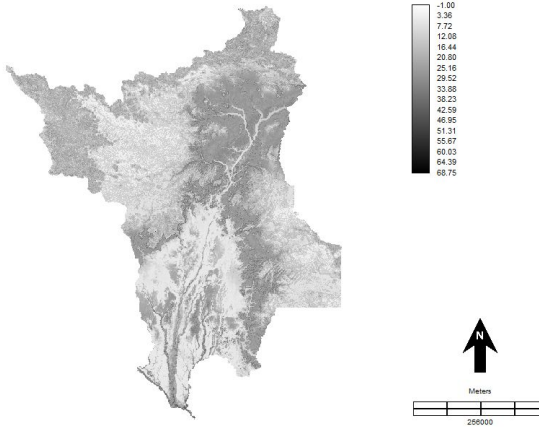
The GEOMOD parameters used ensure the same suitability maps were used within each collection

Notice the decreasing standard deviation and maximum value as more driver variables are included

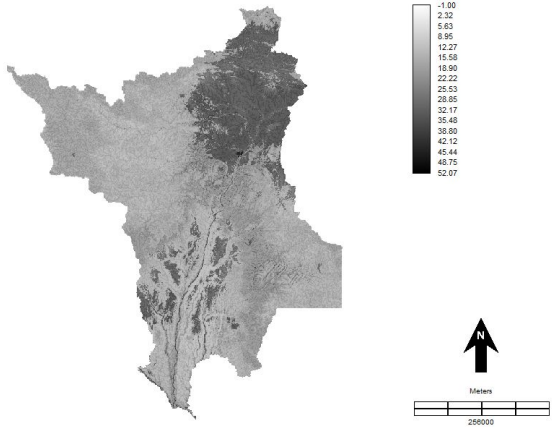
Collection A Suitability Map

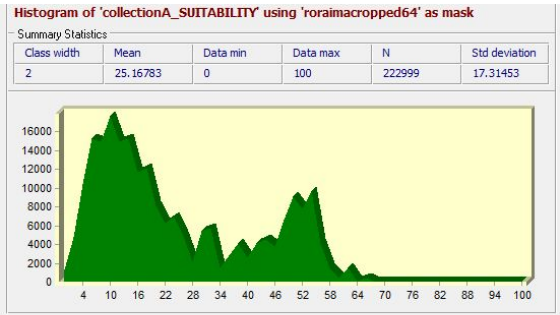


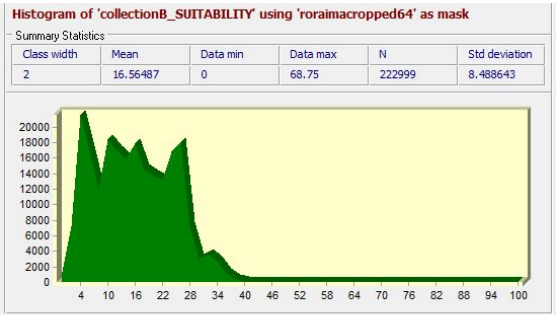
Collection B Suitability Map

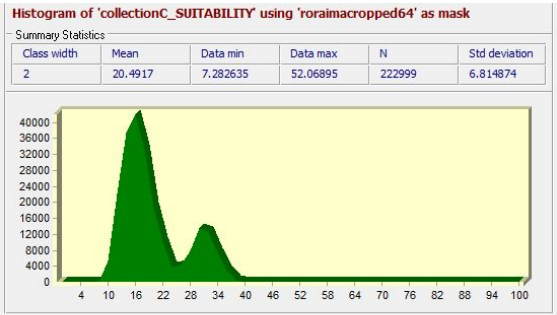


Collection C Suitability



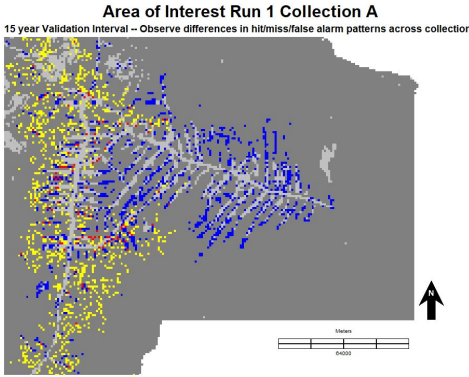


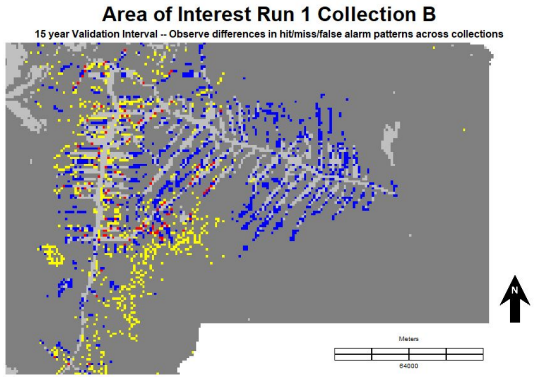


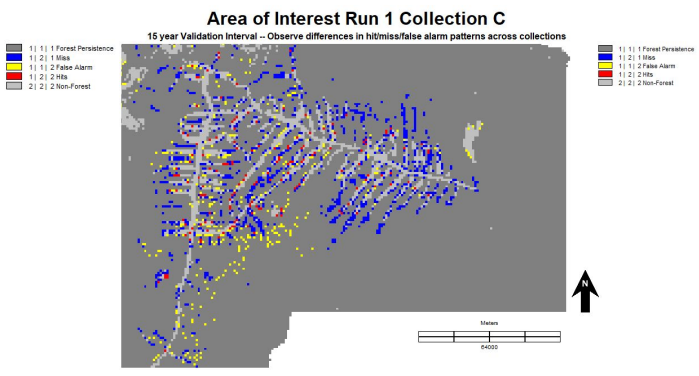


From left to right: Collection A, B, C

Viewer should notice an increase in misses and hits and a decrease in false alarms as number of Driver Variables increases. A decrease in False Alarms with an increase in Hits suggests a improvement in allocation as number of Driver Variables increases.





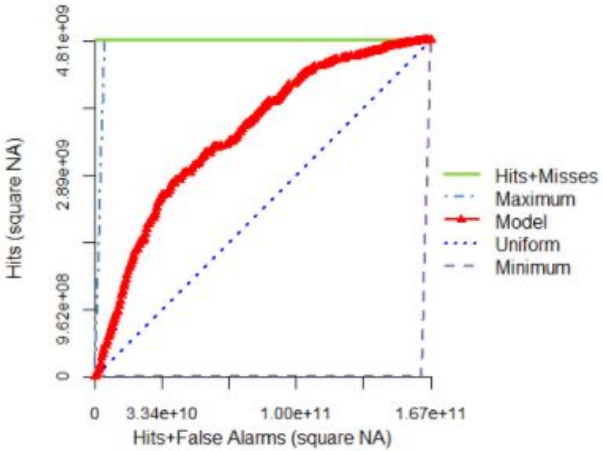


The three images displayed should lead the viewer to see GEOMOD's capability to simulate forest loss to increase as the Driver Variables used increases from Elevation to Elevation and Slope to Elevation, Slope, Indigenous Land, Protection Status, Land Cover, Rivers, Population Density. In addition to the increase in hits, notice the decrease in False Alarms in the southernmost section of the fishbone pattern, suggesting the variables added in Collections B and C demonstrate a connection to forest loss patterns in Roraima.

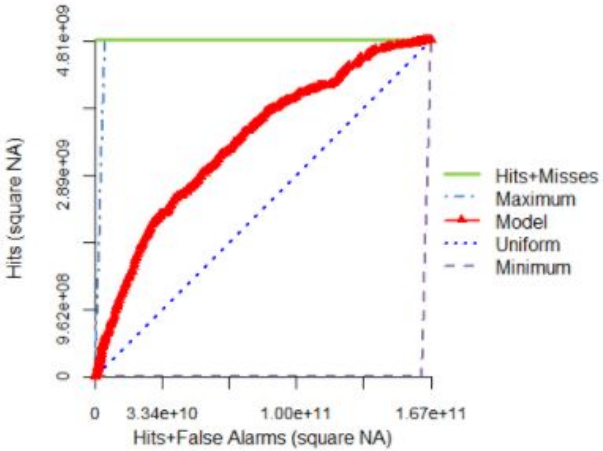
Total Operating Characteristic (TOC)

These figures display how many pixels with forest loss fall exist under each possible suitability value threshold- i.e. displaying the distribution of suitability values within pixels of forest loss from 2000-2015 in each GEOMOD Collection

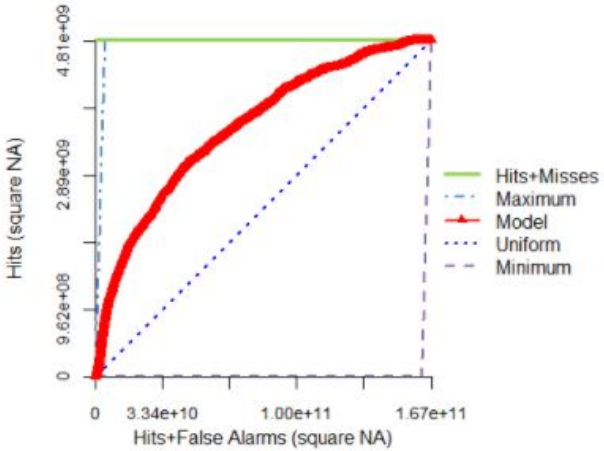
Collection A



Collection B

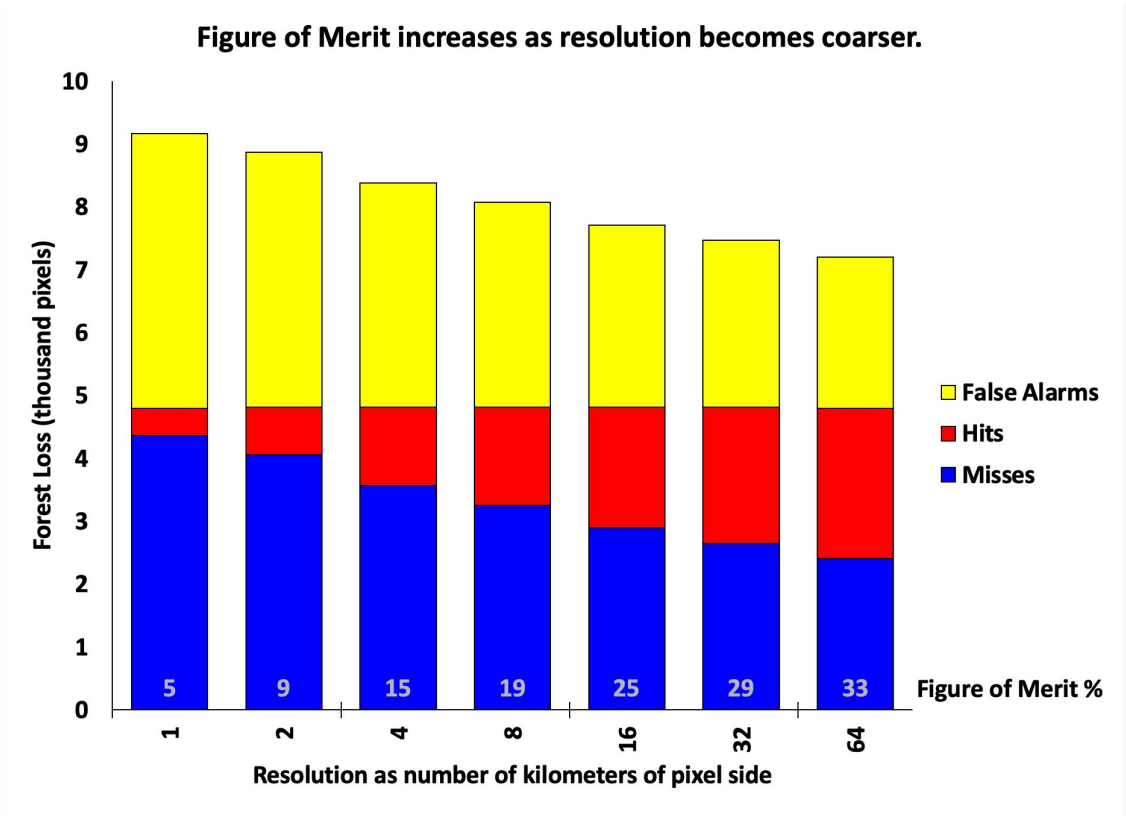


Collection C

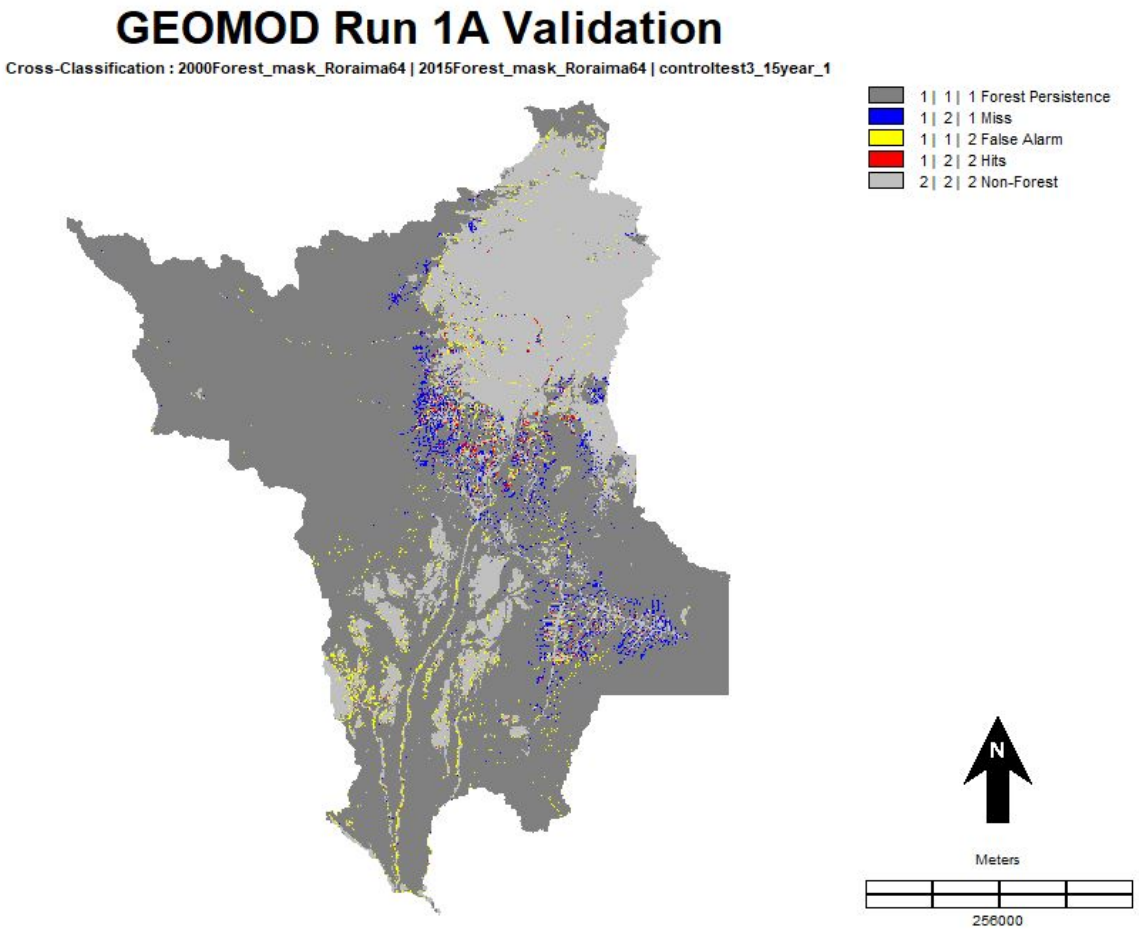


While all three TOC Curves display an expected trend of higher suitability values corresponding to larger volumes of actual forest loss, they do not show any noticeable differences that connect to conclusions we can make about the role of Driver Variables in each Collection.

Multi Resolution Analysis of 15 year Elevation Driver GEOMOD Run Validation



15 year Elevation Driver GEOMOD Run Validation



Conclusion

In this project we observed differences in GEOMOD outputs as changes were implemented in validation period length and driver variables. This analysis displayed an increase in Figure of Merit as validation period length increased and number of driver variables increased.

As number of driver variables increased, we also noticed a more accurate allocation of forest loss in the agricultural “fishbone” formation.

References

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