Lecture given at the

WCS Workshop on Land Change Modeling for REDD

October 25– 29, 2010

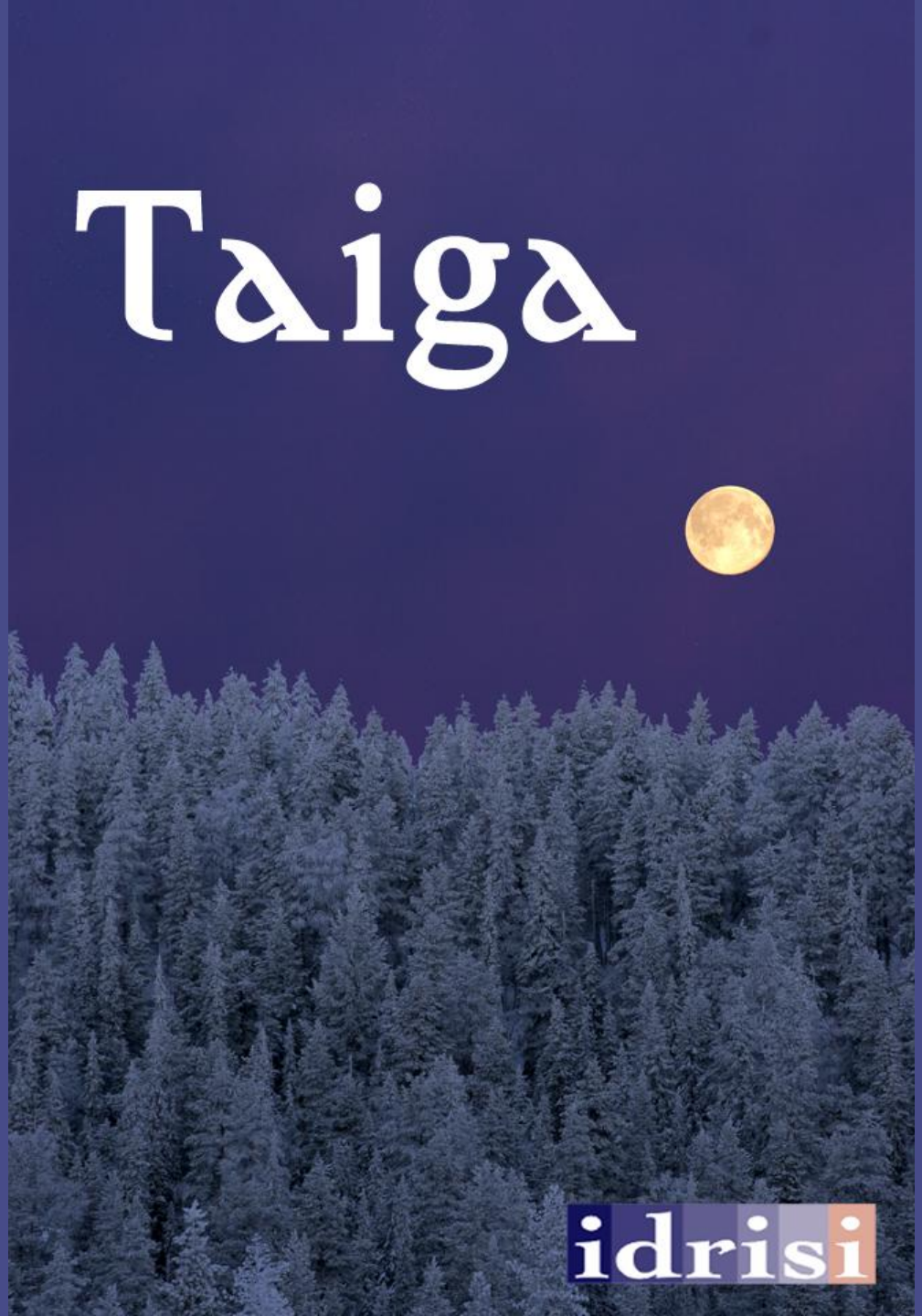
Wildlife Conservation Society - Bronx Zoo
Bronx, New York, USA

Hosted by

Clark Labs and the Wildlife Conservation Society

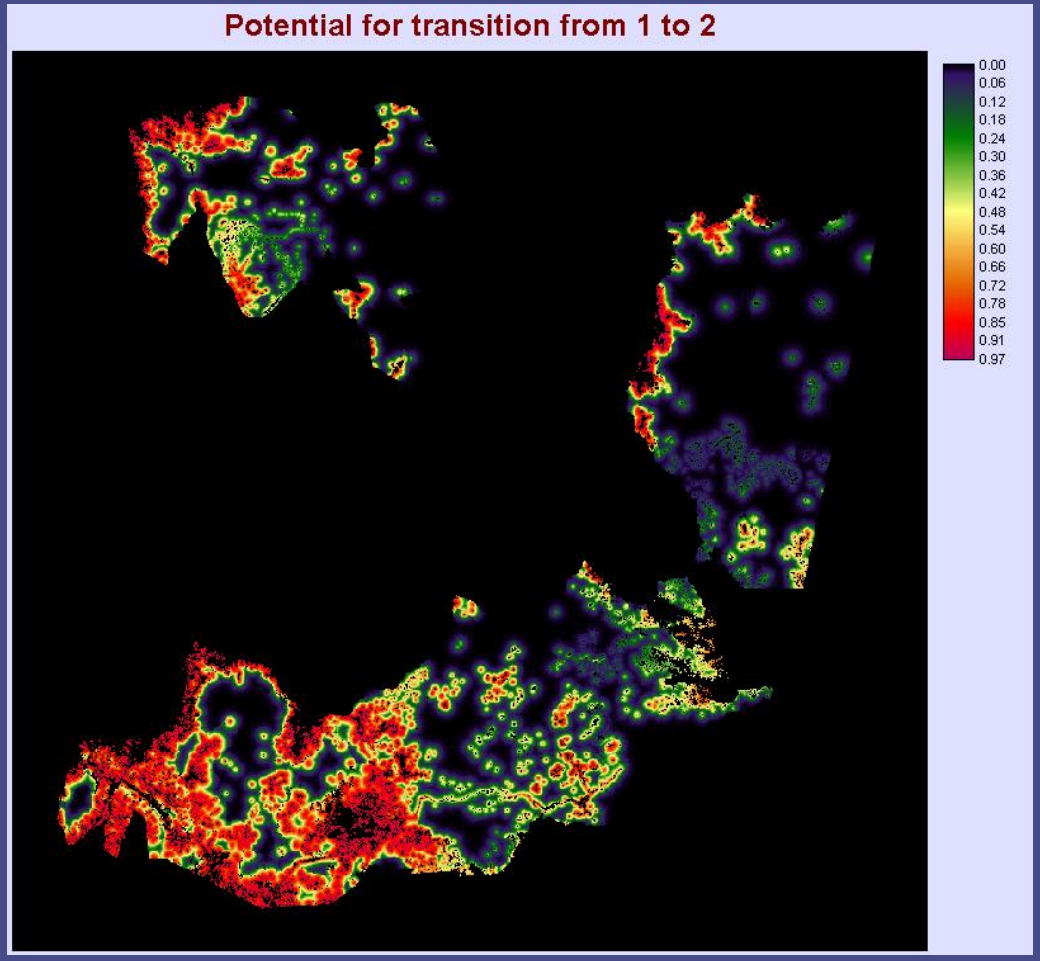
This workshop was generously supported by the American people through the United States Agency for International Development (USAID), under the terms of the TransLinks Cooperative Agreement No.EPP-A-00-06-00014-00 to the Wildlife Conservation Society (WCS). TransLinks is a partnership of WCS, The Earth Institute, Enterprise Works/VITA, Forest Trends and the Land Tenure Center. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States government.

Taiga

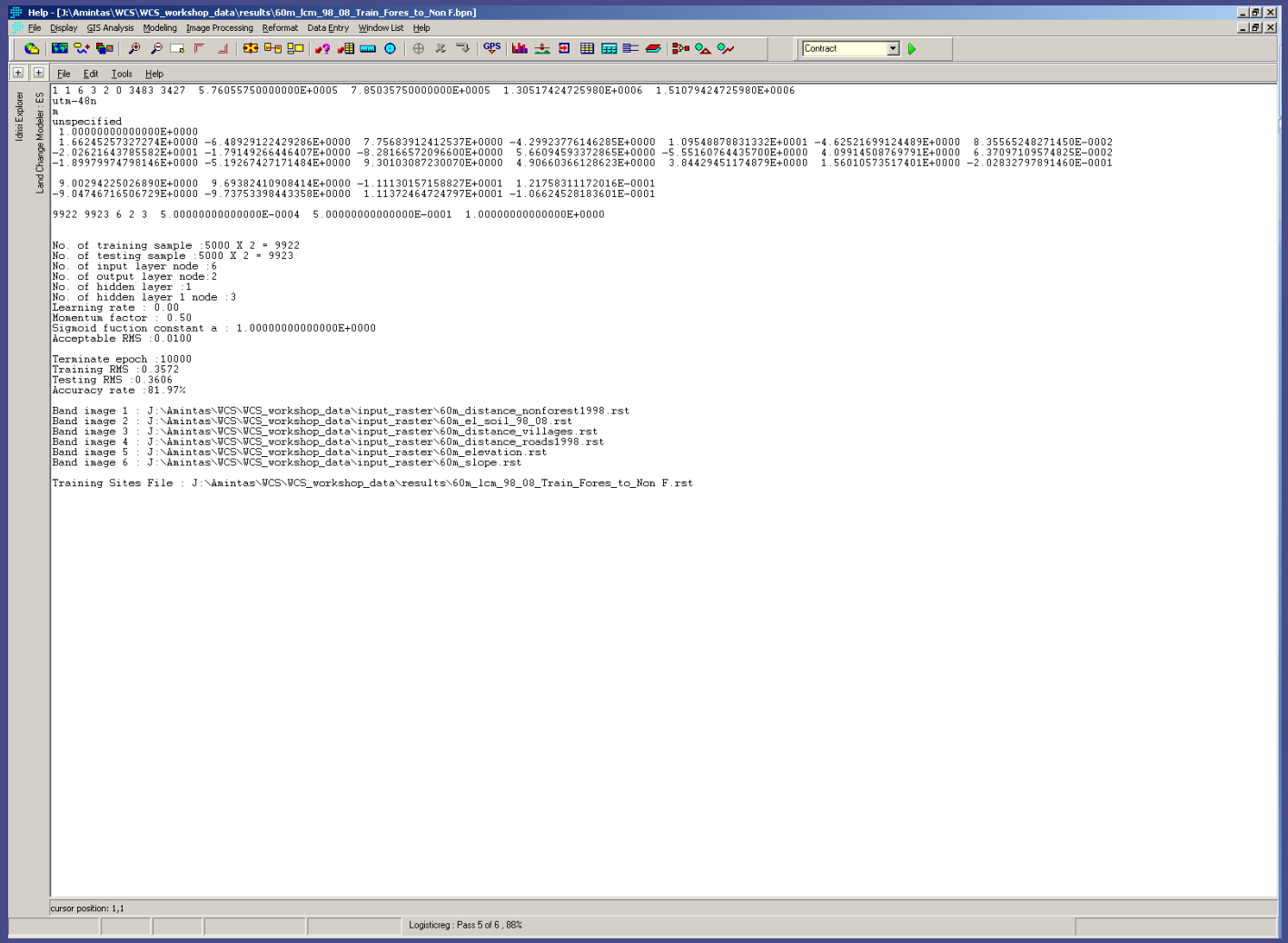


Transition Potential - MLP

Multi-Layer Perceptron



Weights


Help - [J:\Amintas\WCS\WCS_workshop_data\results\60m_lcm_98_08_Train_Fores_to_Non F.bpn]
File Display GIS Analysis Modeling Image Processing Reformat Data Entry Window List Help
Contract
File Edit Tools Help
Idrisi Explorer
Land Change Modeler: ES
1 1 6 3 2 0 3483 3427 5.76055750000000E+0005 7.85035750000000E+0005 1.30517424725980E+0006 1.51079424725980E+0006
utm-48n
m
unspecified
1.00000000000000E+0000
1.66245257327274E+0000 -6.48929122429286E+0000 7.75683912412537E+0000 -4.29923776146285E+0000 1.09548878831332E+0001 -4.62521699124489E+0000 8.35565248271450E-0002
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-1.89979974798146E+0000 -5.19267427171484E+0000 9.30103087230070E+0000 4.90660366128623E+0000 3.84429451174879E+0000 1.56010573517401E+0000 -2.02832797891460E-0001
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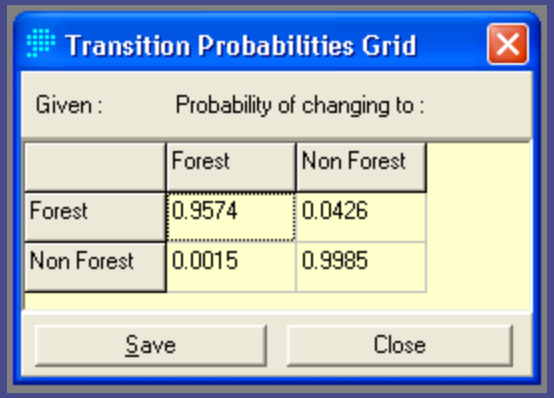
-9.04746716506729E+0000 -9.73753398443358E+0000 1.11372464724797E+0001 -1.06624528183601E-0001
9922 9923 6 2 3 5.00000000000000E-0004 5.00000000000000E-0001 1.00000000000000E+0000
No. of training sample :5000 X 2 = 9922
No. of testing sample :5000 X 2 = 9923
No. of input layer node :6
No. of output layer node:2
No. of hidden layer :1
No. of hidden layer 1 node :3
Learning rate : 0.00
Momentum factor : 0.50
Sigmoid fuction constant a : 1.00000000000000E+0000
Acceptable RMS :0.0100
Terminate epoch :10000
Training RMS :0.3572
Testing RMS :0.3606
Accuracy rate :81.97%
Band image 1 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_distance_nonforest1998.rst
Band image 2 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_el_soil_98_08.rst
Band image 3 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_distance_villages.rst
Band image 4 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_distance_roads1998.rst
Band image 5 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_elevation.rst
Band image 6 : J:\Amintas\WCS\WCS_workshop_data\input_raster\60m_slope.rst
Training Sites File : J:\Amintas\WCS\WCS_workshop_data\results\60m_lcm_98_08_Train_Fores_to_Non F.rst
cursor position: 1,1
Logisticreg : Pass 5 of 6 , 88%

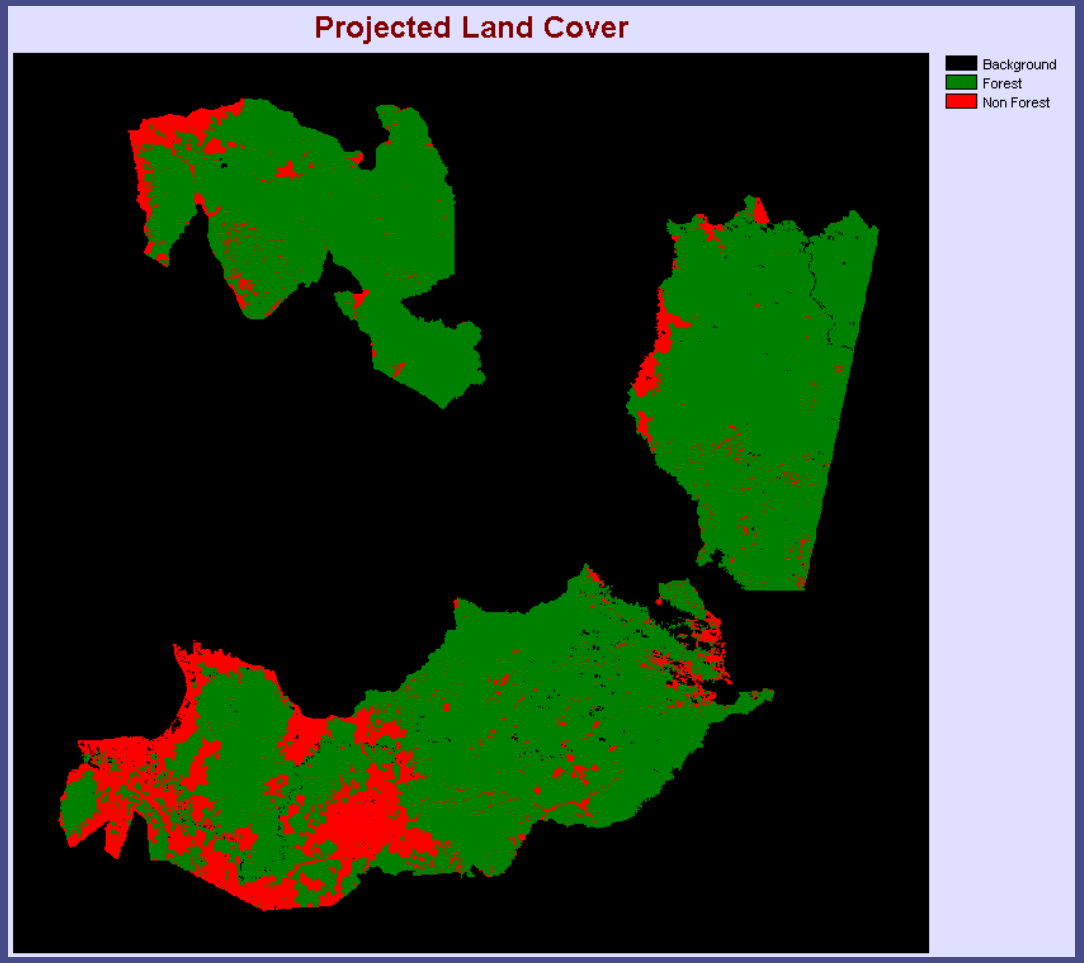
Transition Probabilities



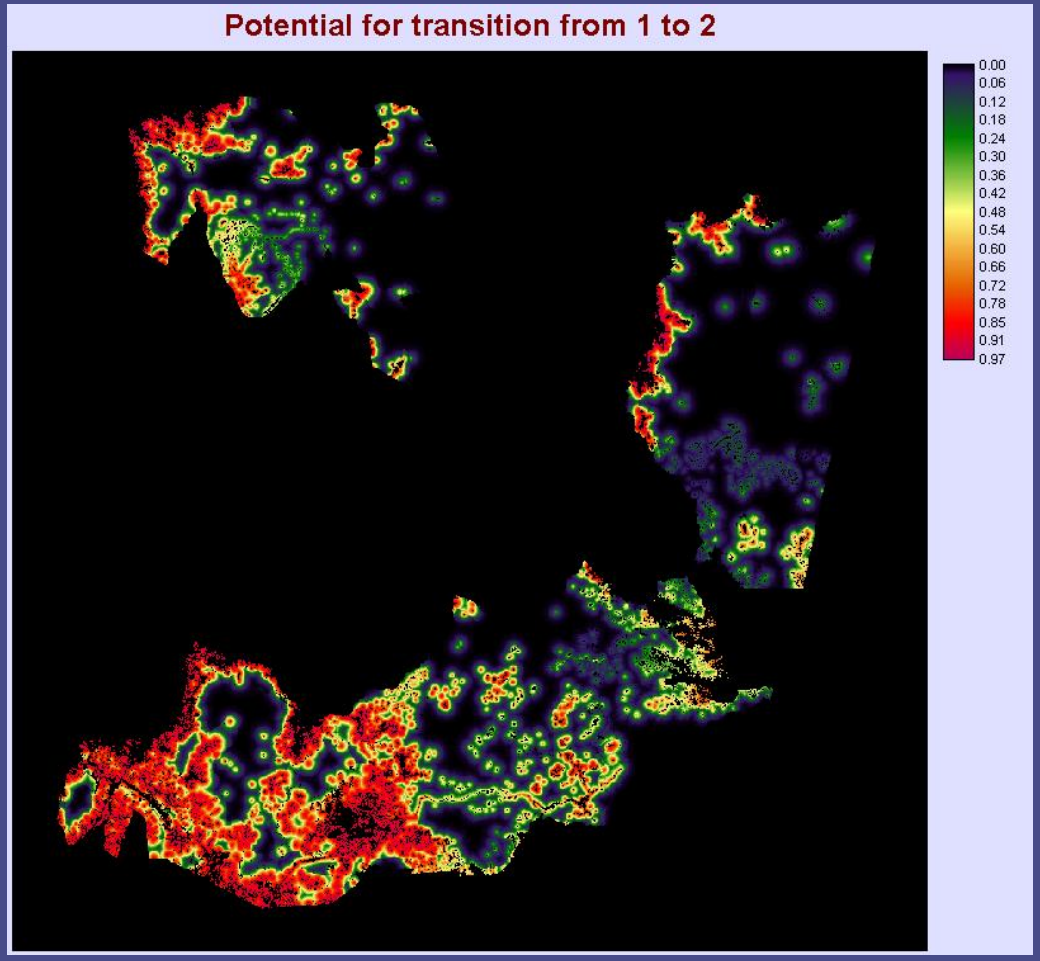
Quantity of change

Probability of change	Value	Unit
Forest2002-NonForest2008	301,391	cells
Forest2002	3,299,668	cells
Transition potential to validate 2002 and 2008		
Persistence of Forest	0.9087	
Change to NonForest	0.0913	

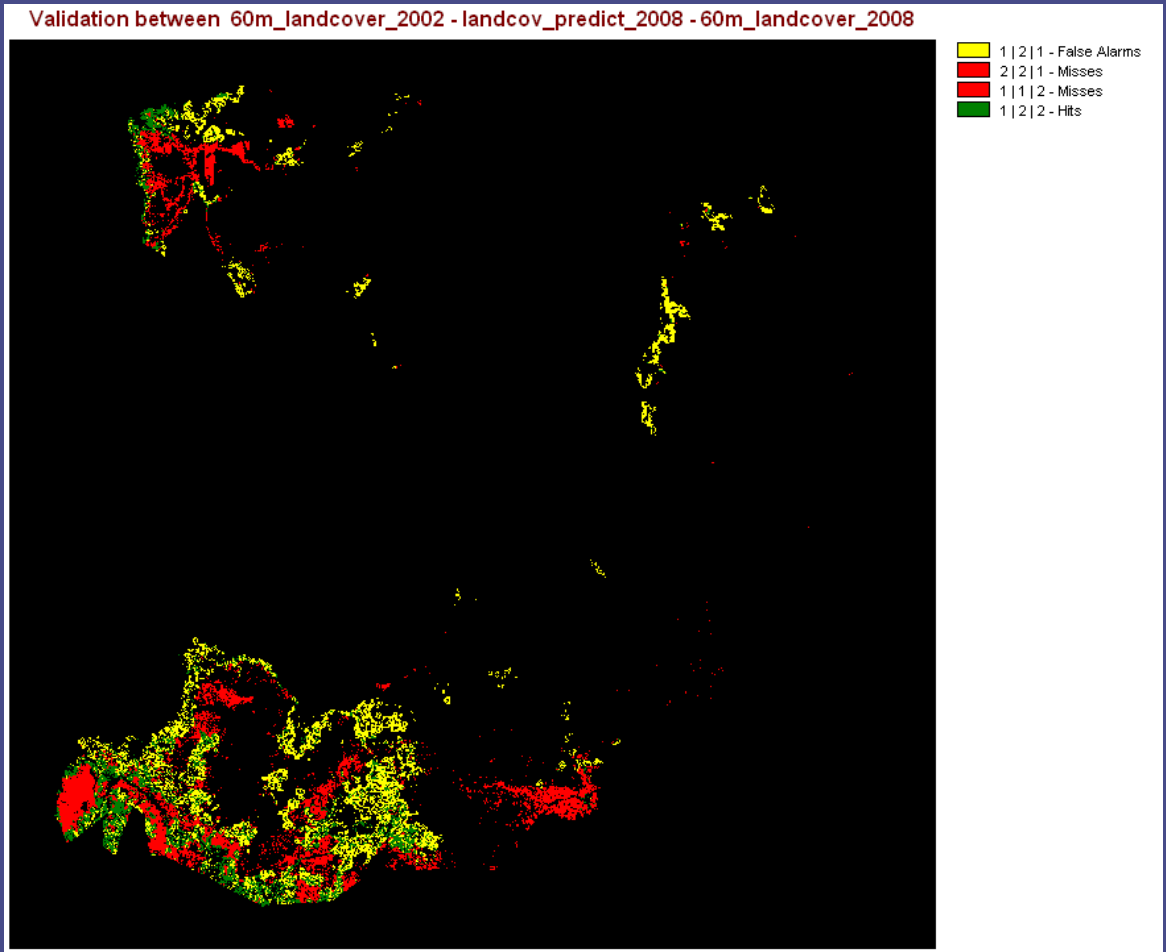
Prediction - Hard



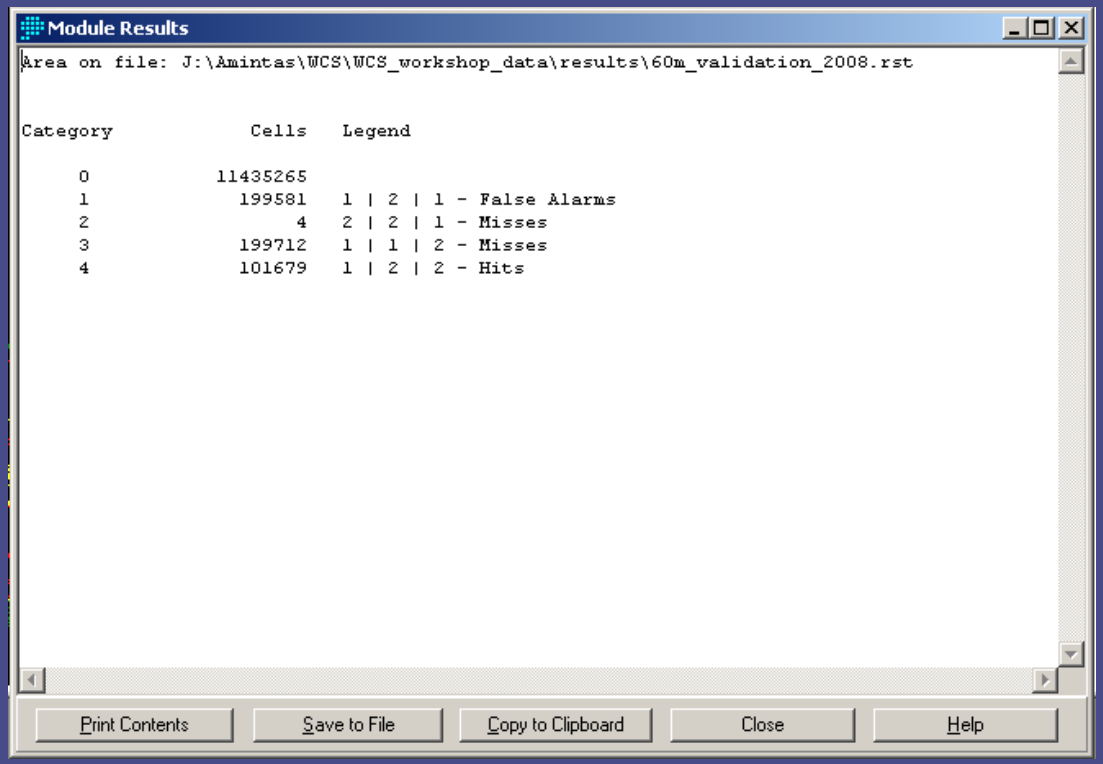
Prediction - Soft



Validation - Crosstabulation

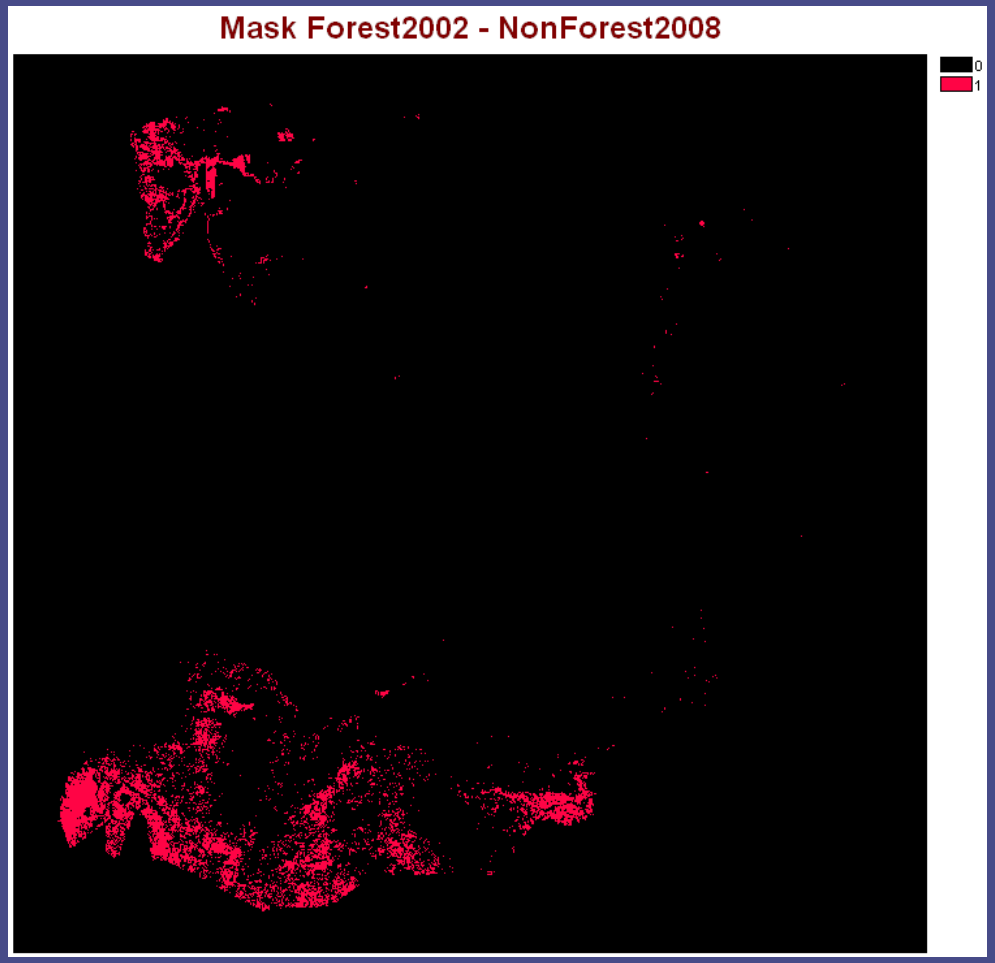


Validation – Area



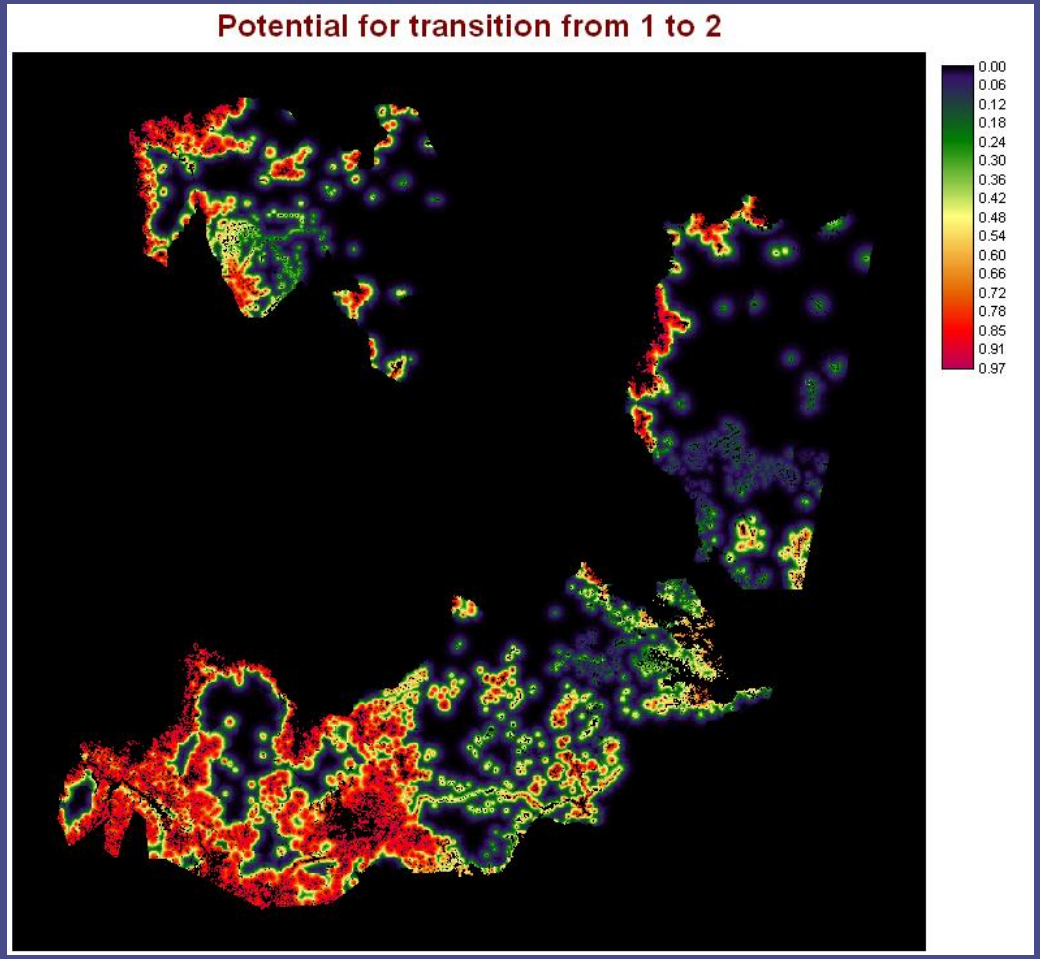
Validation – Histogram

Forest 2002 – Non Forest 2008



Validation – Histogram

Transition Potential 2002



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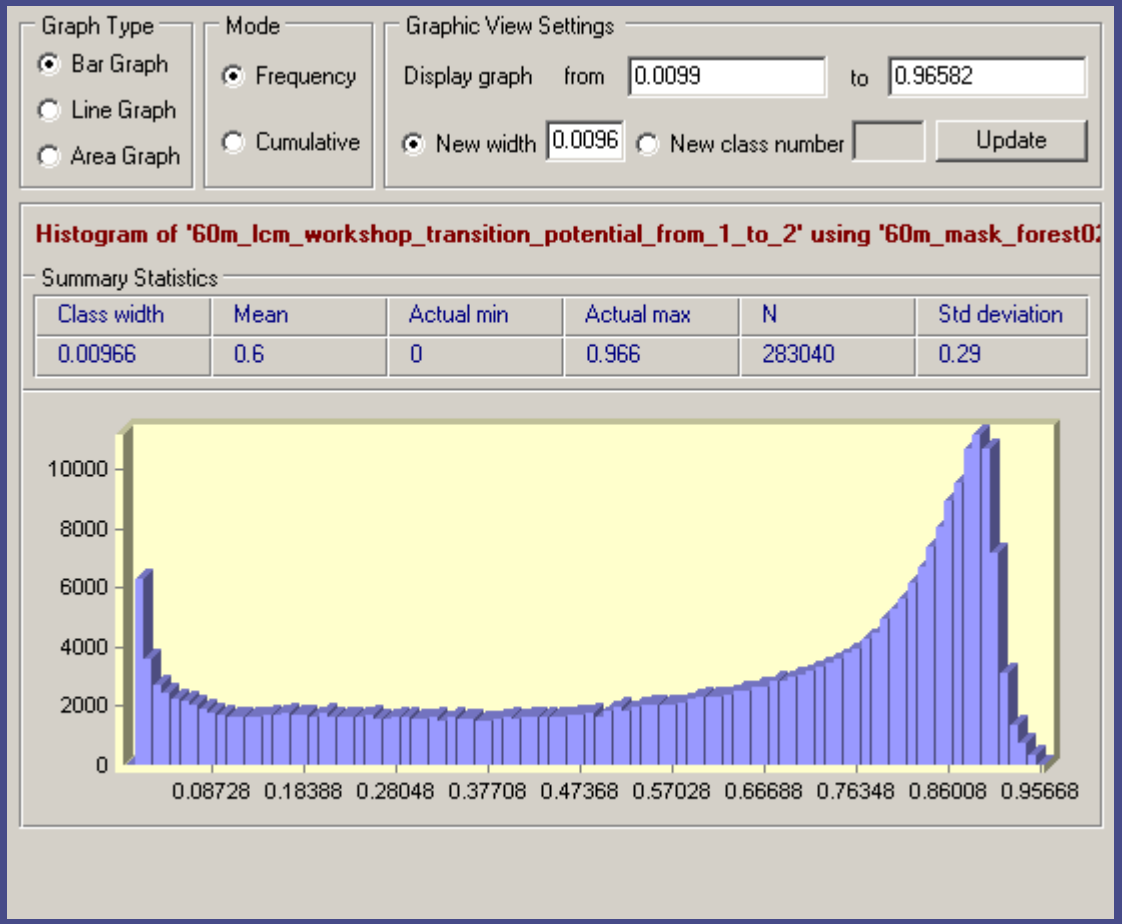
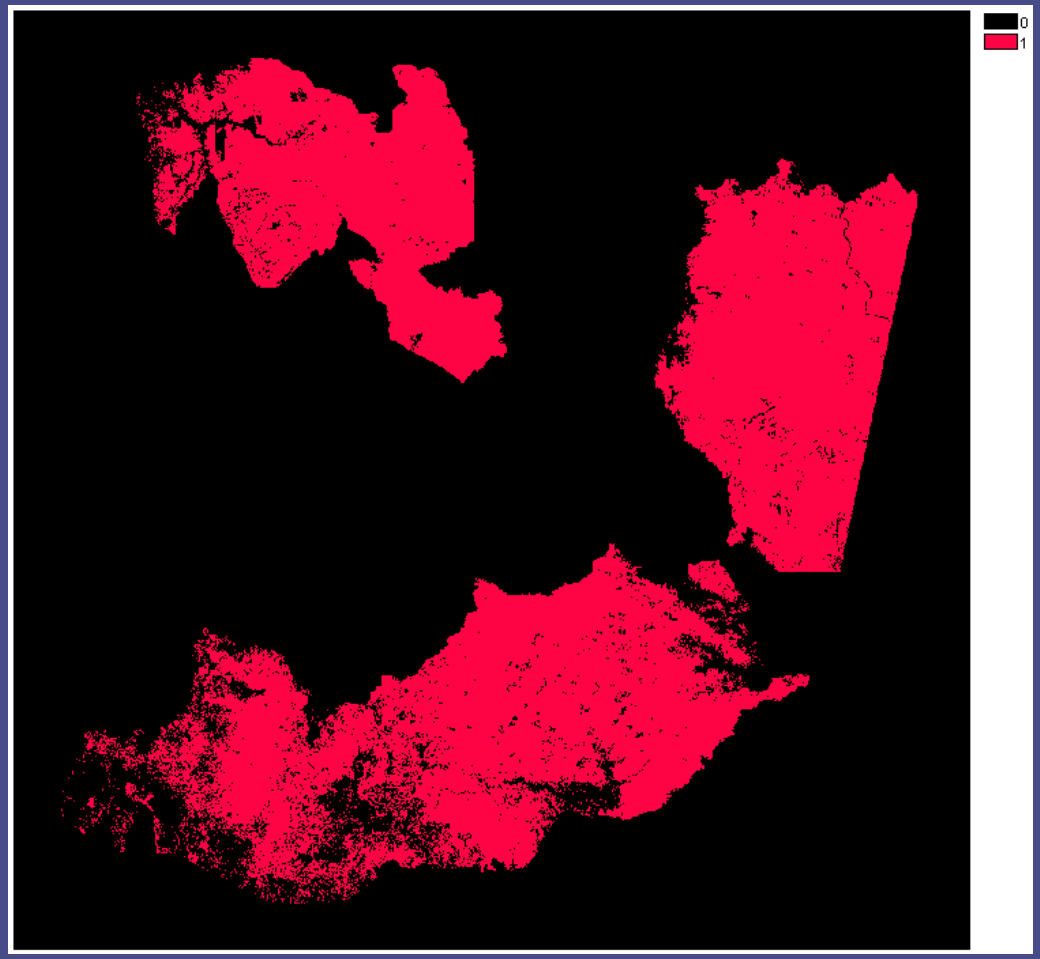
Forest 2002 – Non Forest 2008 vs. Transition Potential



Validation – Histogram

Persistence 2002 – 2008



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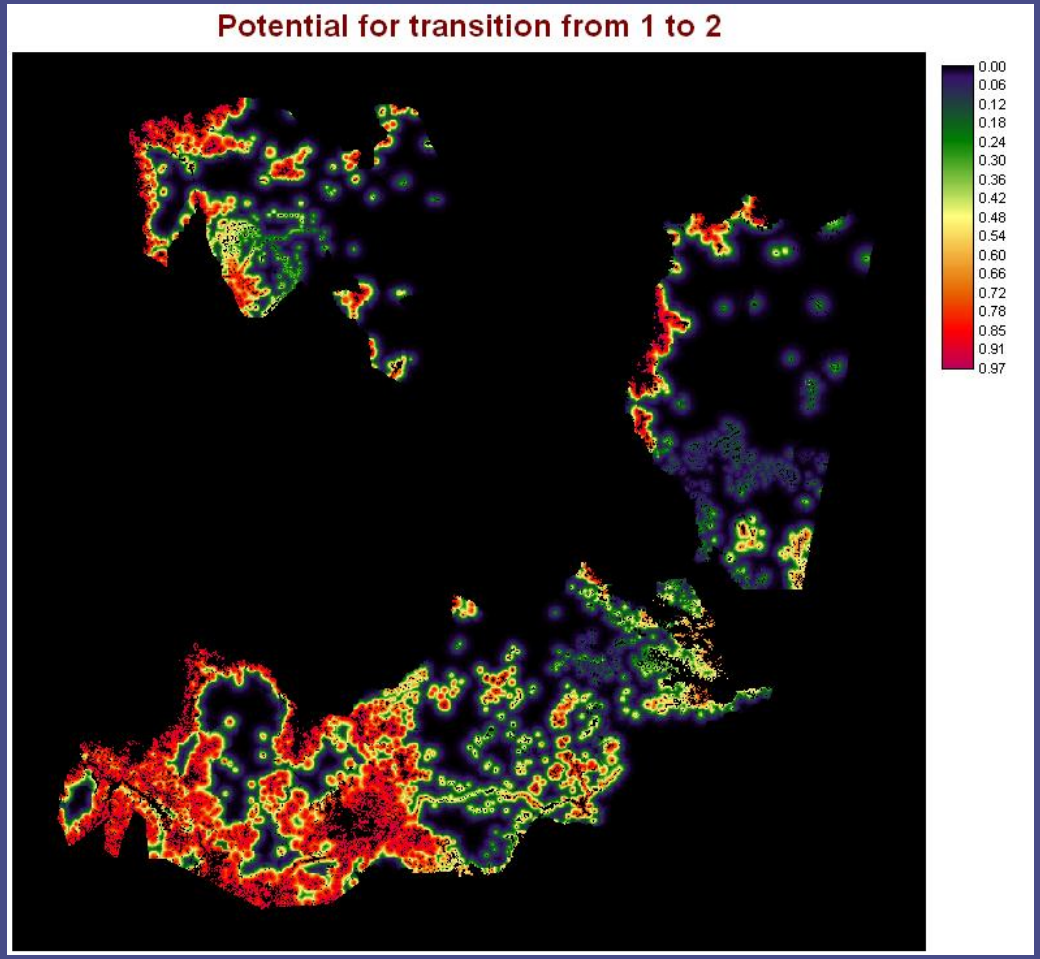
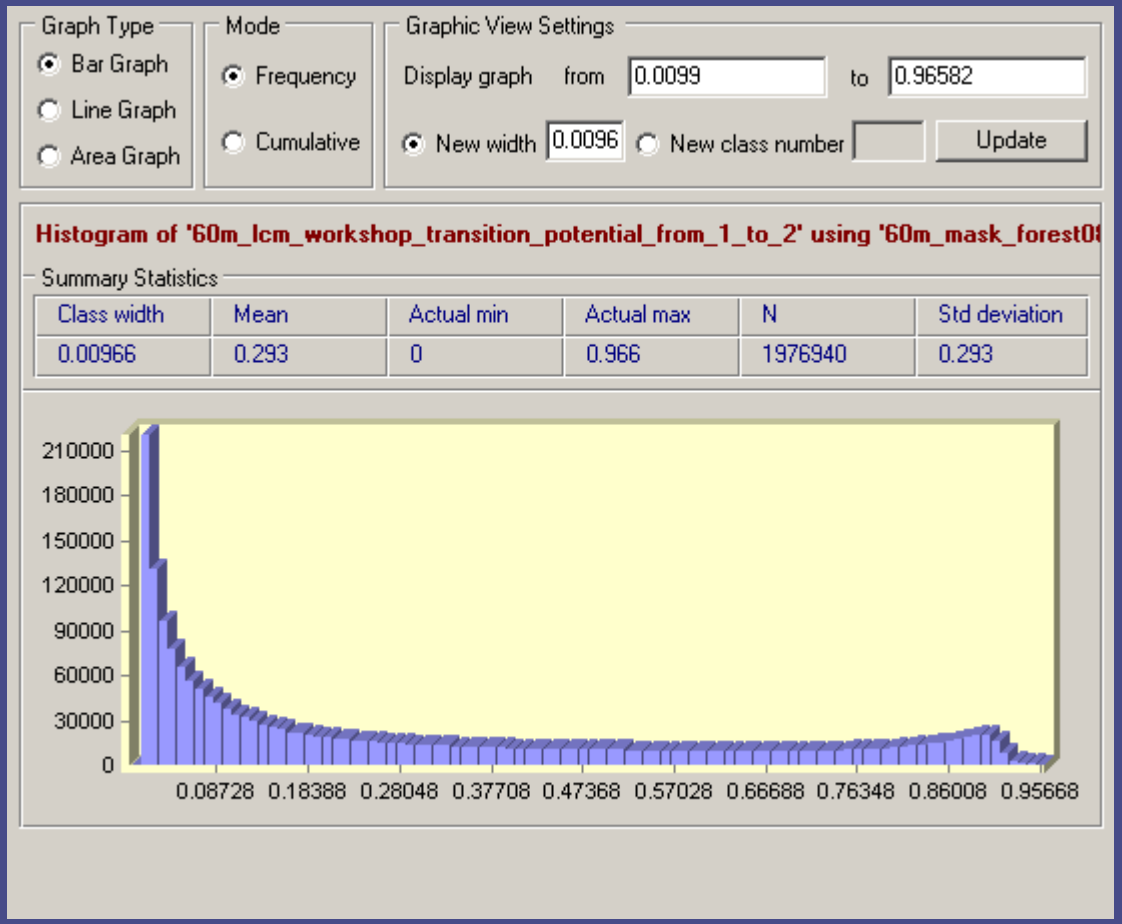
Transition Potential 2002



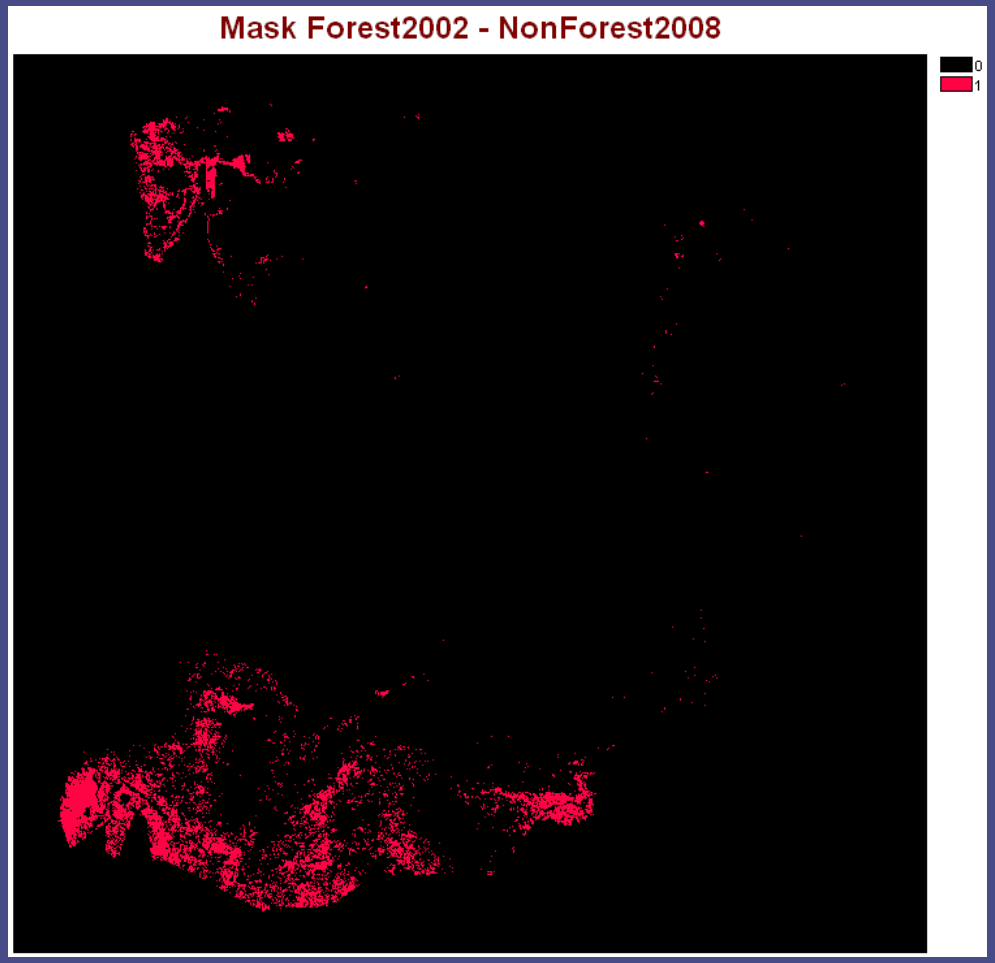
Validation – Histogram

Persistence 2002 – 2008 vs. Transition Potential



ROC – Relative Operating Characteristic

Forest 2002 – Non Forest 2008



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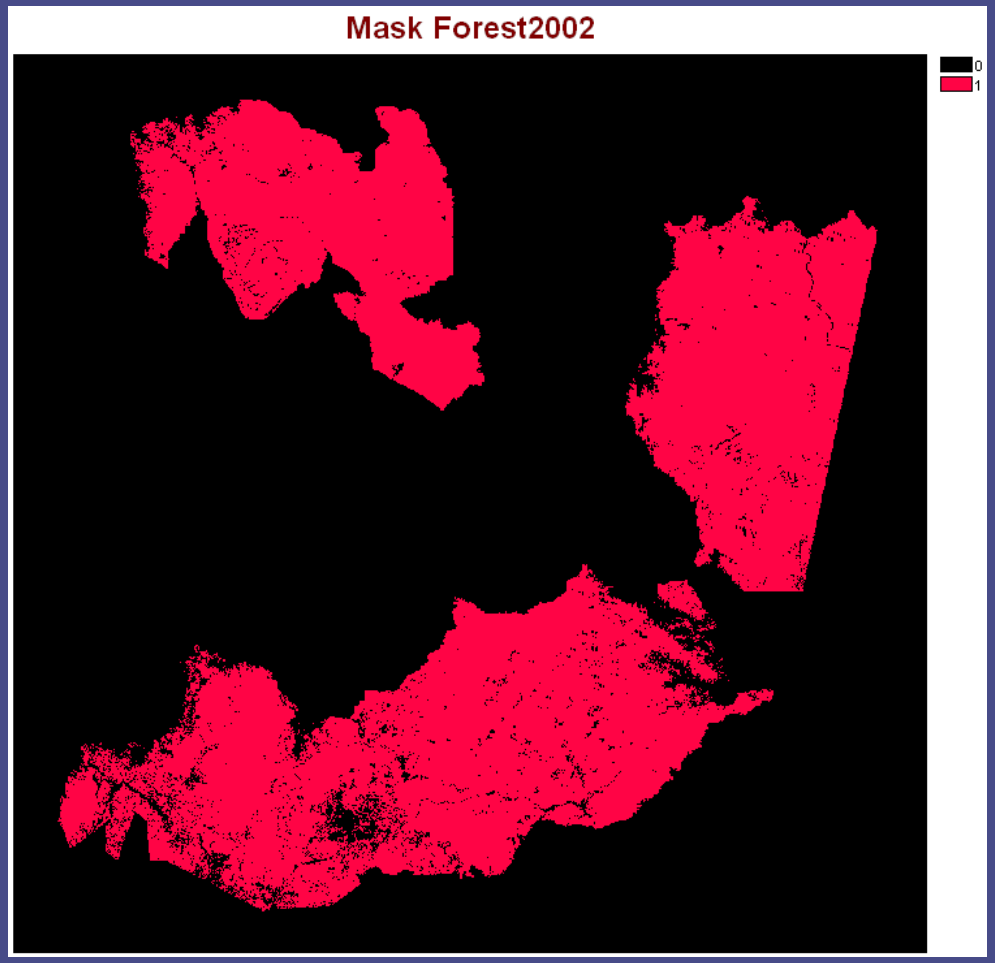

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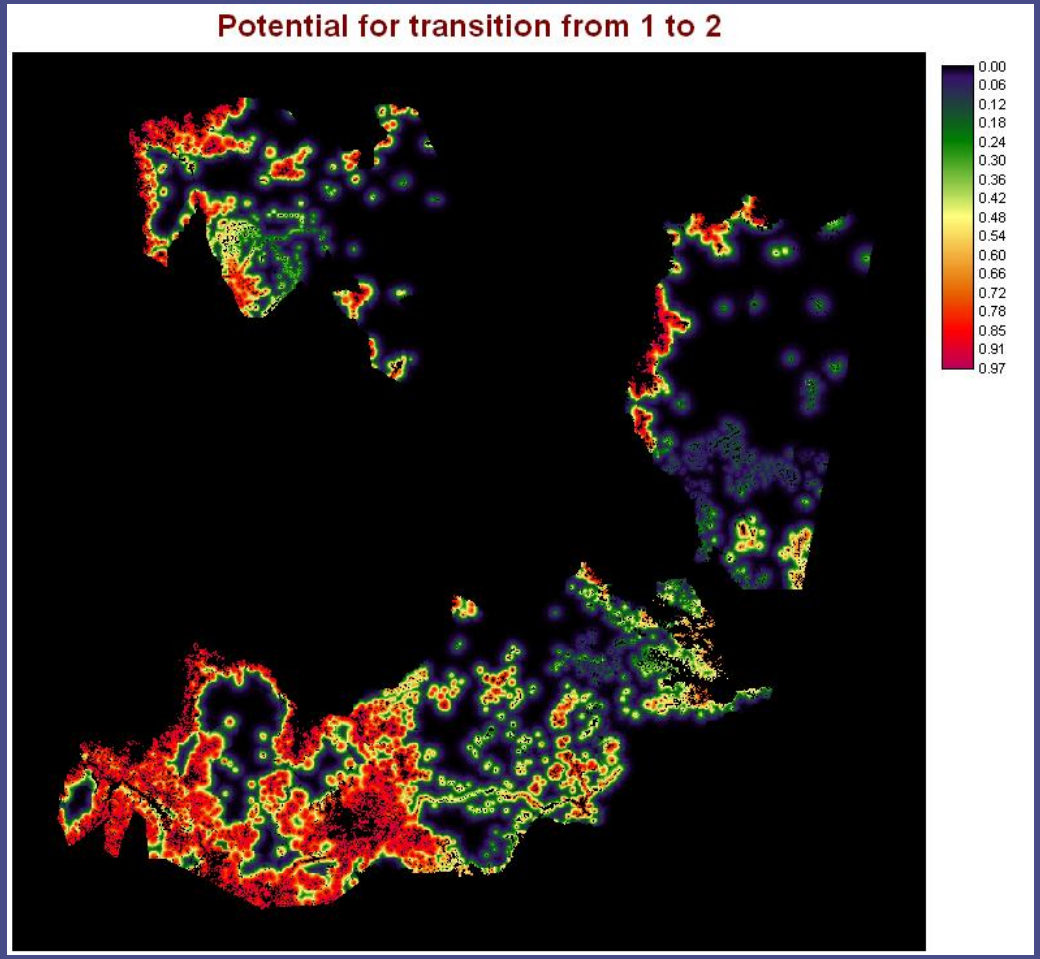

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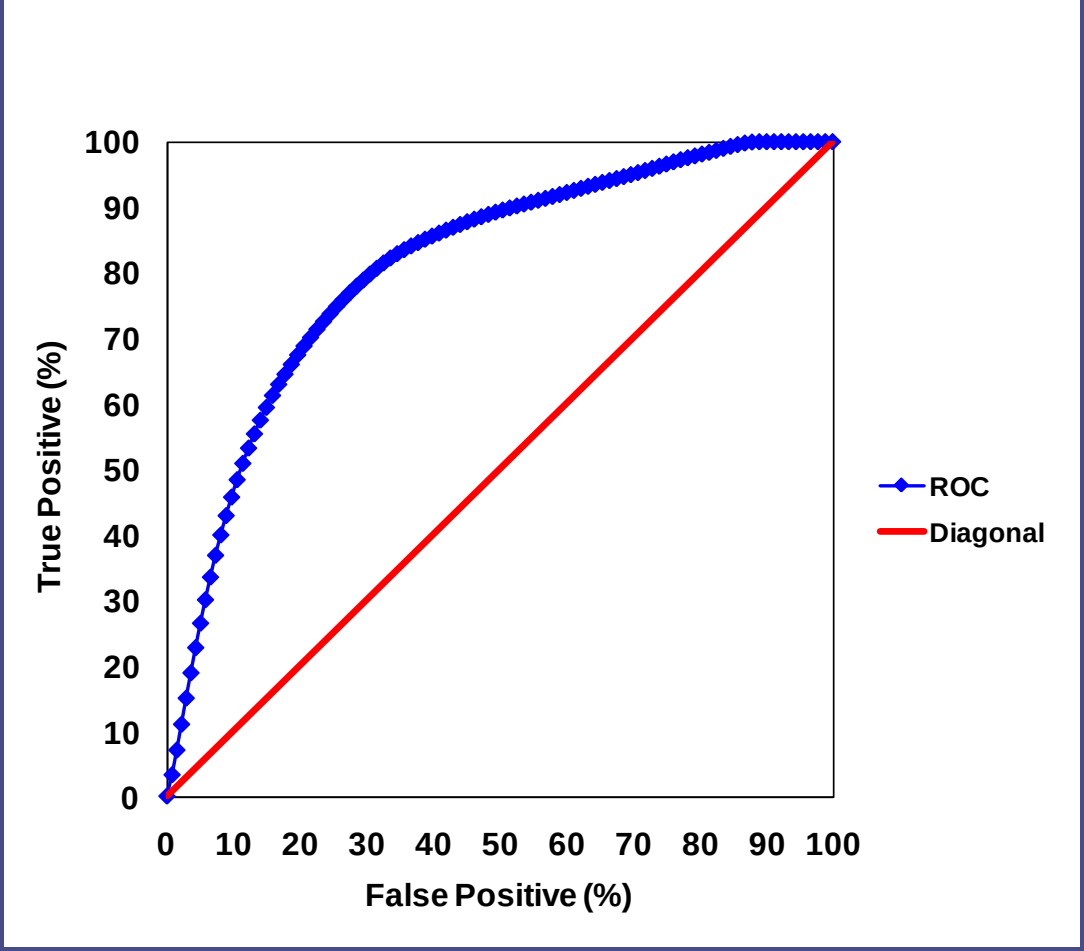
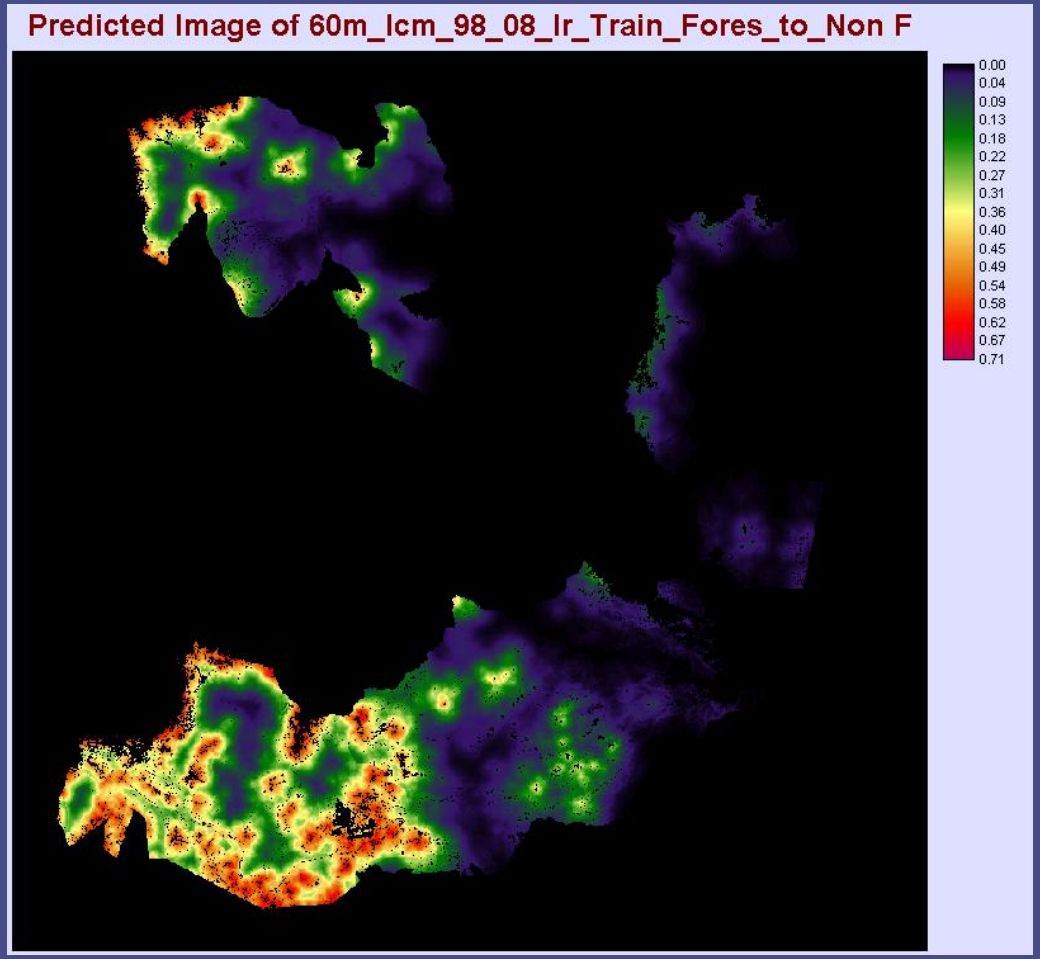


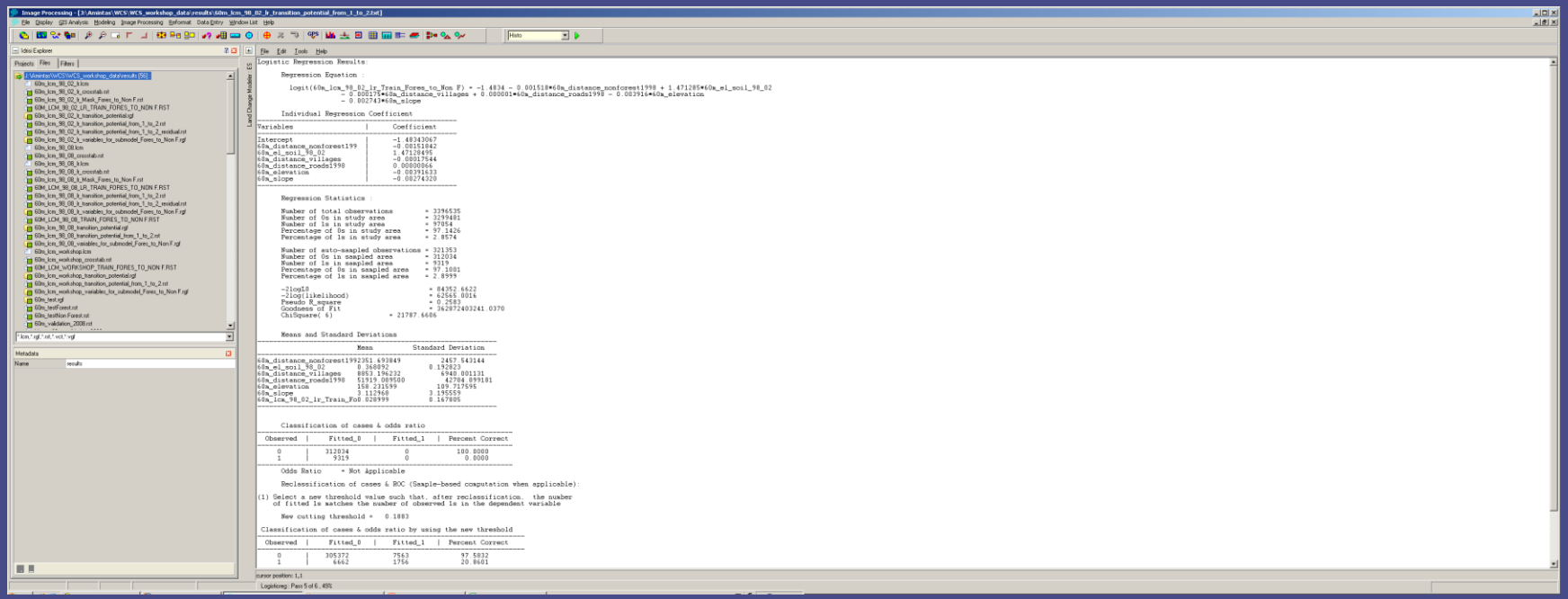
AUC – Area Under the Curve

Transition Potential - LR

Logistic Regression



Weights



Logistic Regression Results:

Regression Equation

logit(60a_lcm_98_02_lr_Train_Fores_to_Non F) = -1.4834 - 0.001518*60a_distance_nonforest1998 + 1.471285*60a_el_soil_98_02 - 0.000175*60a_distance_villages + 0.000001*60a_distance_roads1998 - 0.003916*60a_elevation - 0.002743*60a_slope

Individual Regression Coefficient

Variables	Coefficient
Intercept	-1.48343067
60a_distance_nonforest199	-0.00151842
60a_el_soil_98_02	1.47128495
60a_distance_villages	-0.00017544
60a_distance_roads1998	0.00000066
60a_elevation	-0.00391633
60a_slope	-0.00274320

Regression Statistics

Number of total observations = 3396535
Number of 0s in study area = 3299481
Number of 1s in study area = 97054
Percentage of 0s in study area = 97.1426
Percentage of 1s in study area = 2.8574

Number of auto-sampled observations = 321353
Number of 0s in sampled area = 312034
Number of 1s in sampled area = 9319
Percentage of 0s in sampled area = 97.1001
Percentage of 1s in sampled area = 2.8999

-2logL0 = 84352.6622
-2log(likelihood) = 62565.0016
Pseudo R_square = 0.2583
Goodness of Fit = 3628724032 41.0370
ChiSquare(6) = 21787.6606

Means and Standard Deviations

	Mean	Standard Deviation
60a_distance_nonforest1998	2351.693849	2457.543144
60a_el_soil_98_02	0.368092	0.192823
60a_distance_villages	8853.196232	6948.001131
60a_distance_roads1998	51919.089500	42704.899101
60a_elevation	158.231599	109.717595
60a_slope	3.112968	3.195559
60a_lcm_98_02_lr_Train_Fo0	0.028999	0.167805

Classification of cases & odds ratio

Observed	Fitted_0	Fitted_1	Percent Correct
0	312034	0	100.0000
1	9319	0	0.0000

Odds Ratio = Not Applicable

Reclassification of cases & ROC (Sample-based computation when applicable):

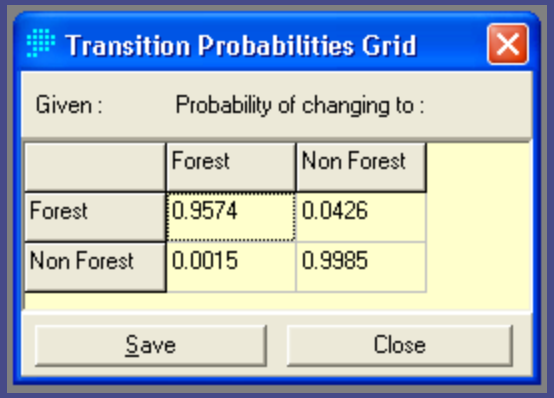
(1) Select a new threshold value such that, after reclassification, the number of fitted 1s matches the number of observed 1s in the dependent variable

New cutting threshold = 0.1883

Classification of cases & odds ratio by using the new threshold

Observed	Fitted_0	Fitted_1	Percent Correct
0	305372	7563	97.5832
1	6662	1756	20.8681

Transition Probabilities



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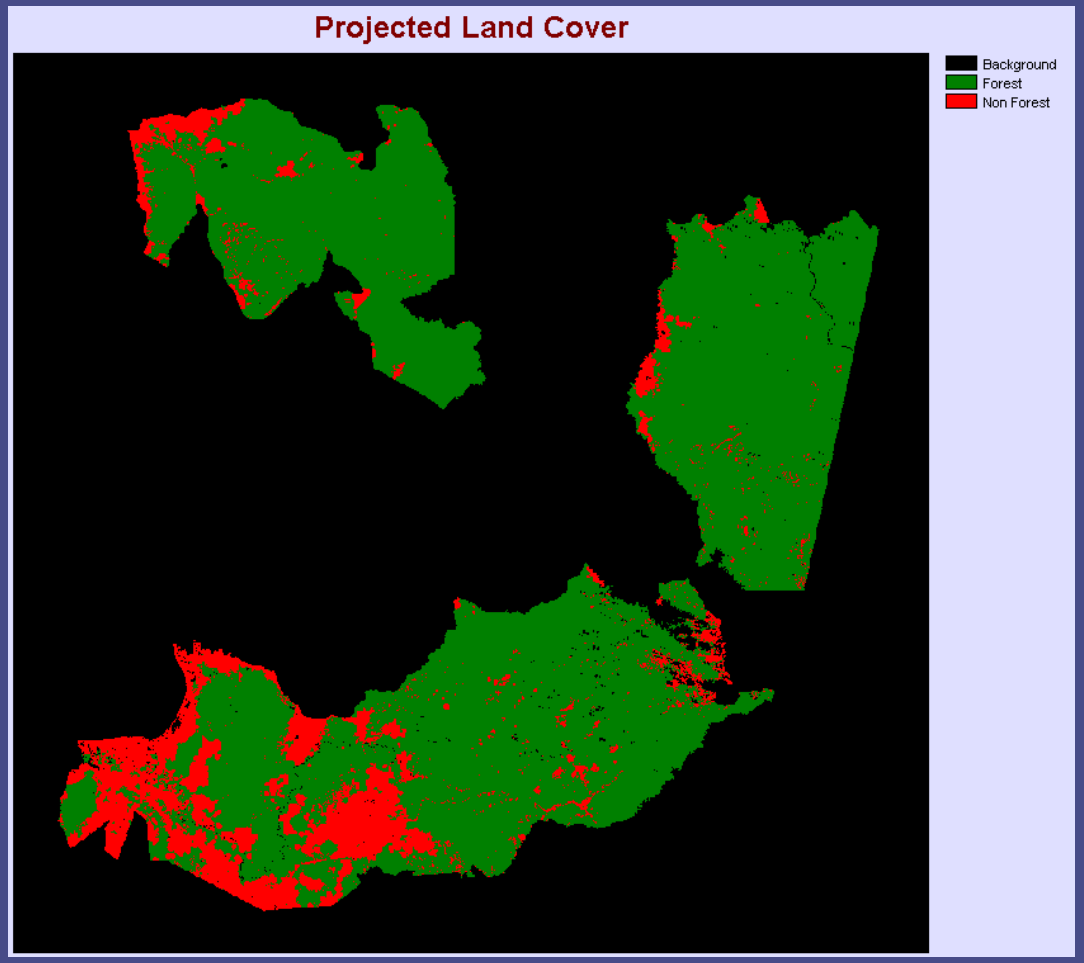

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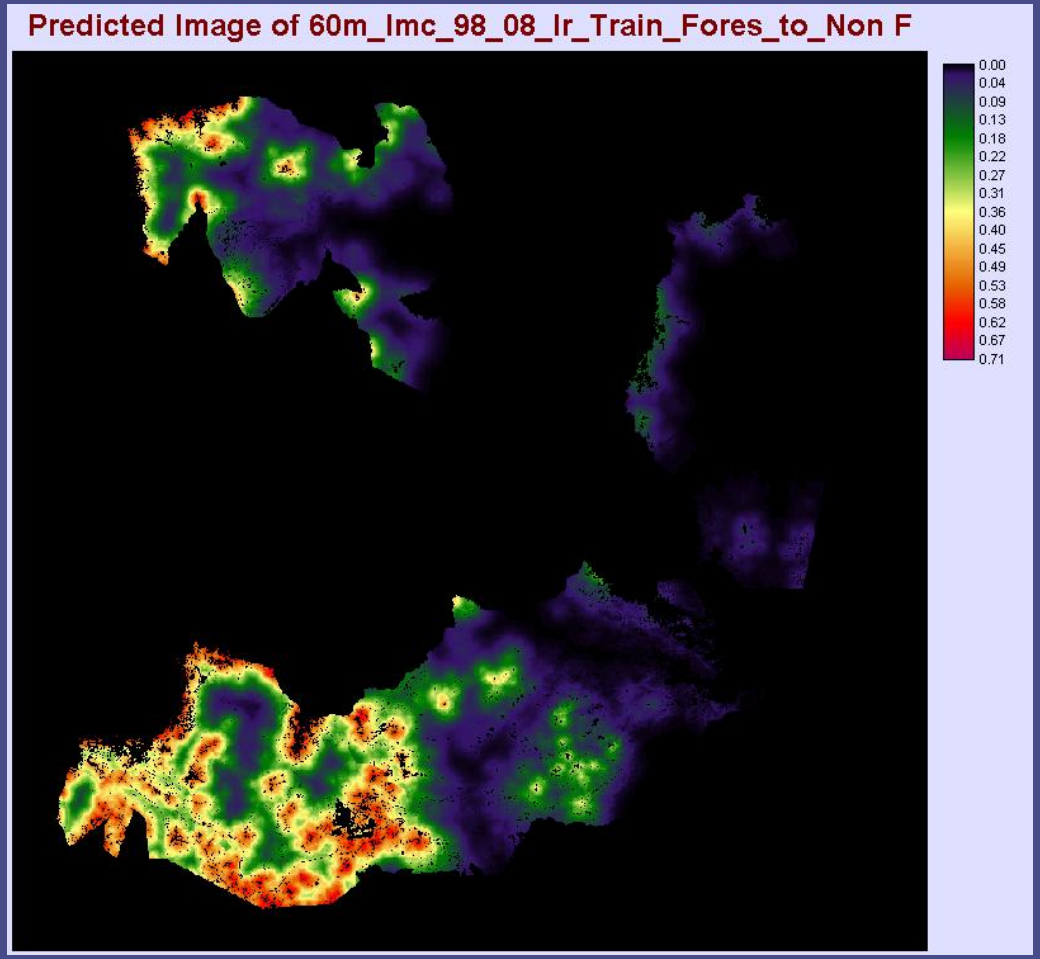

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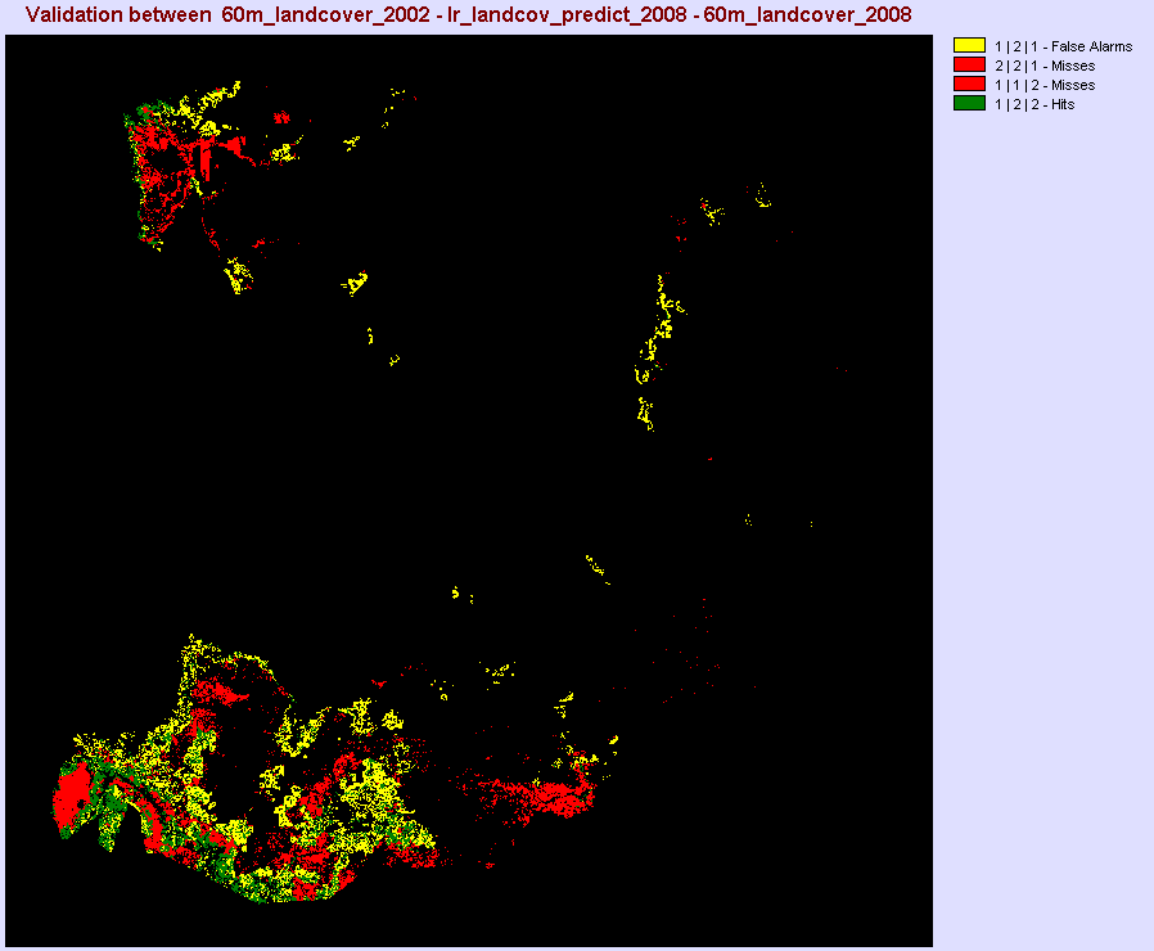
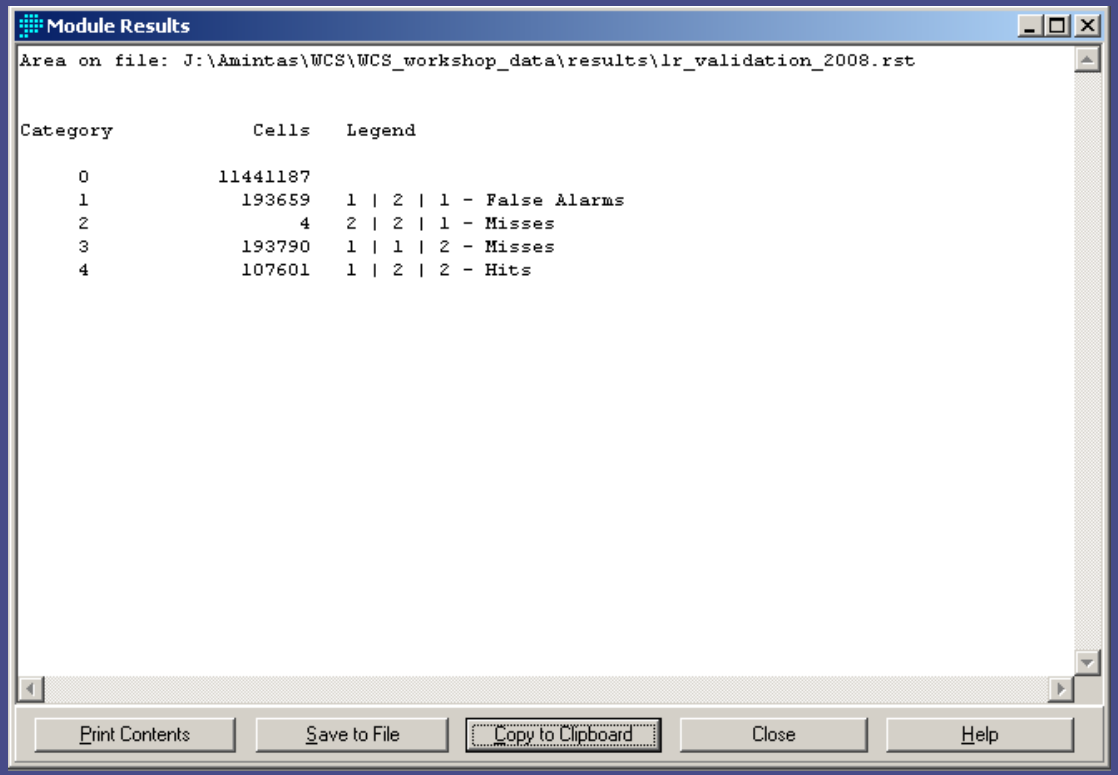
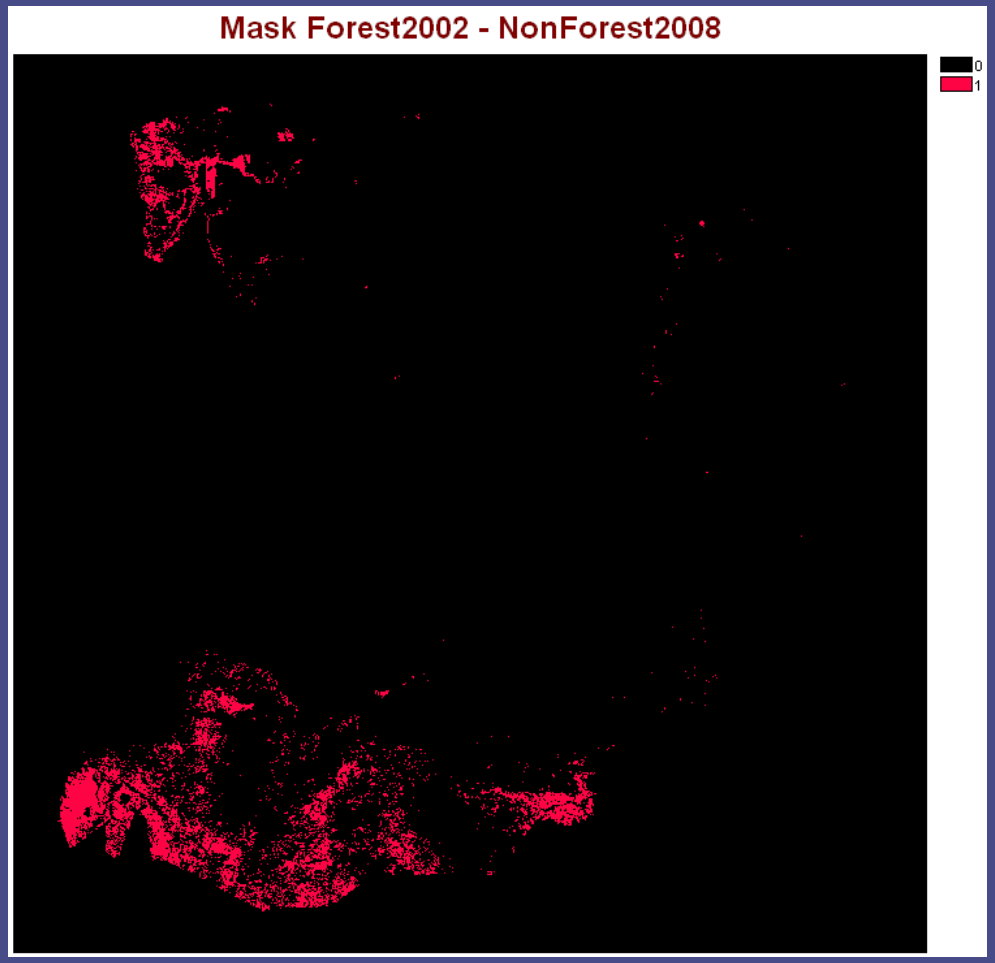


Validation – Area



Validation – Histogram

Forest 2002 – Non Forest 2008



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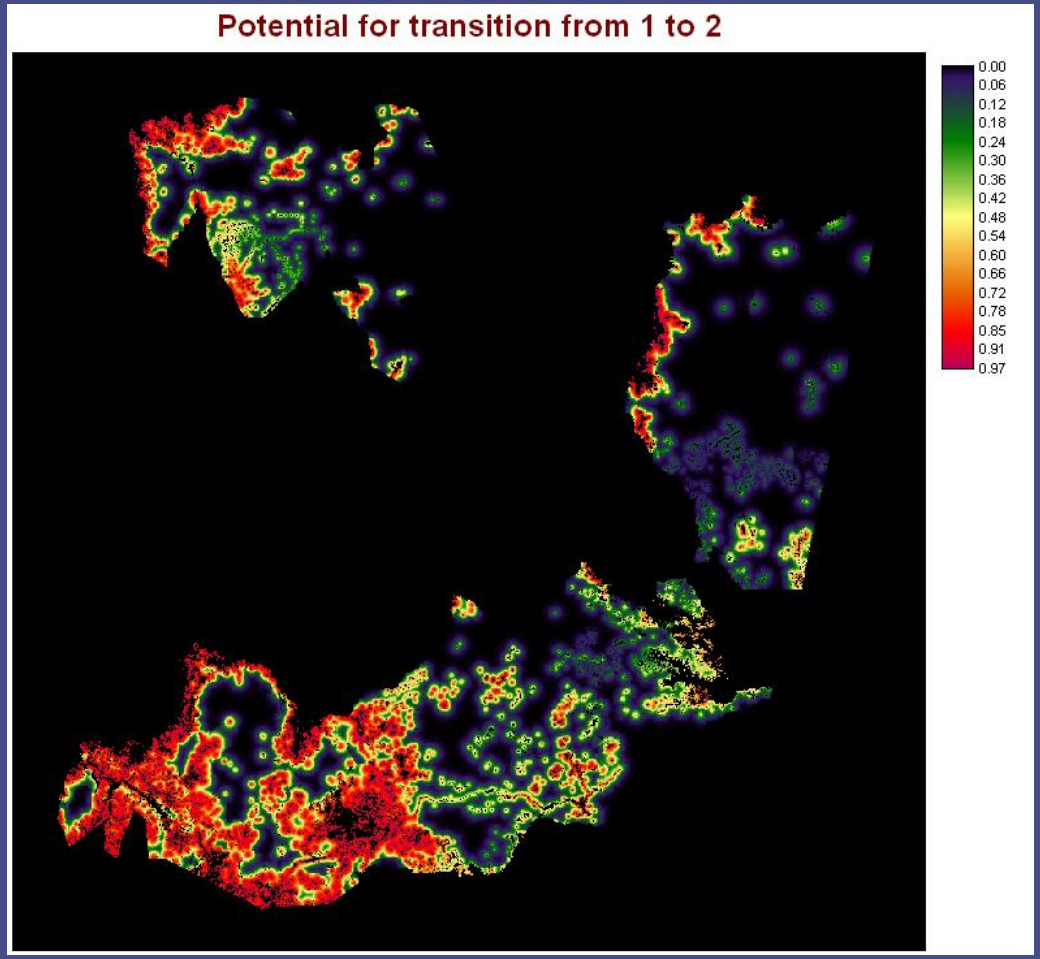
Transition Potential 2002



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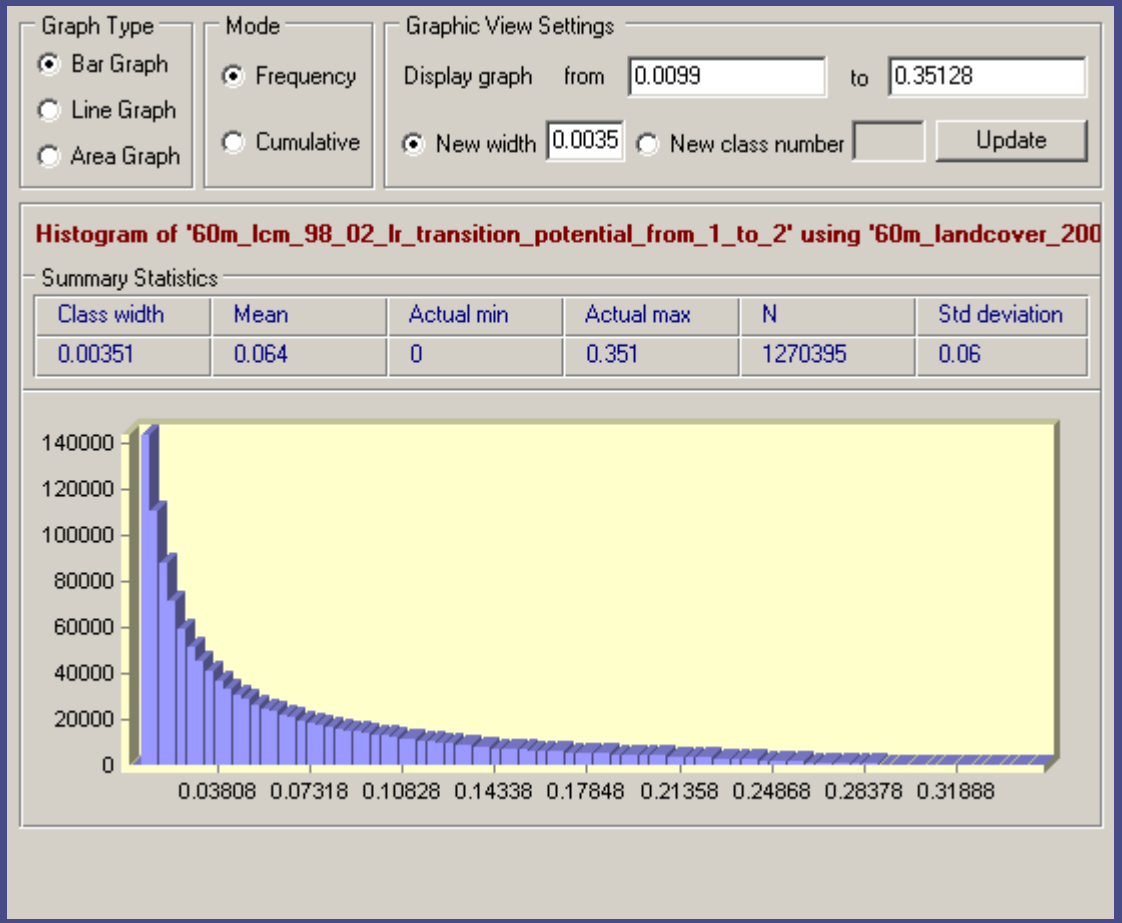
Forest 2002 – Non Forest 2008 vs. Transition Potential



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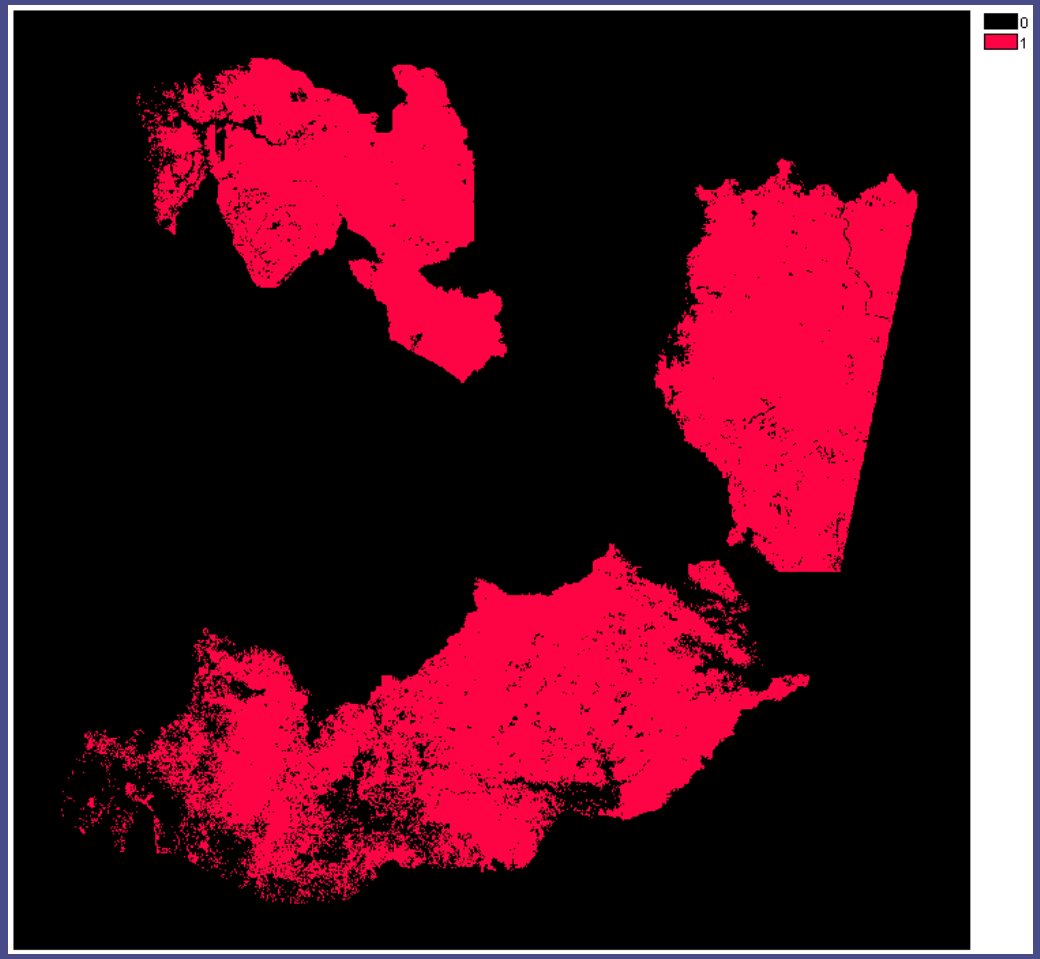
Persistence 2002 – 2008



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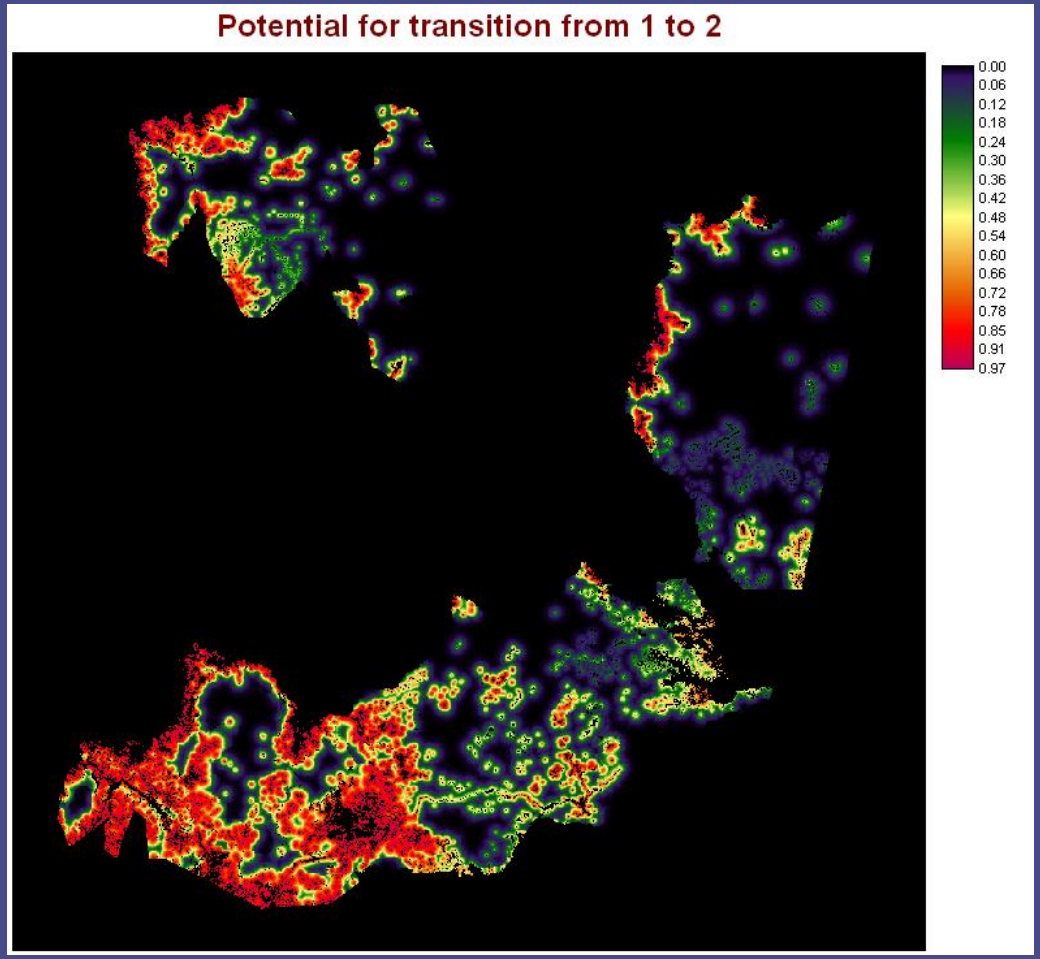
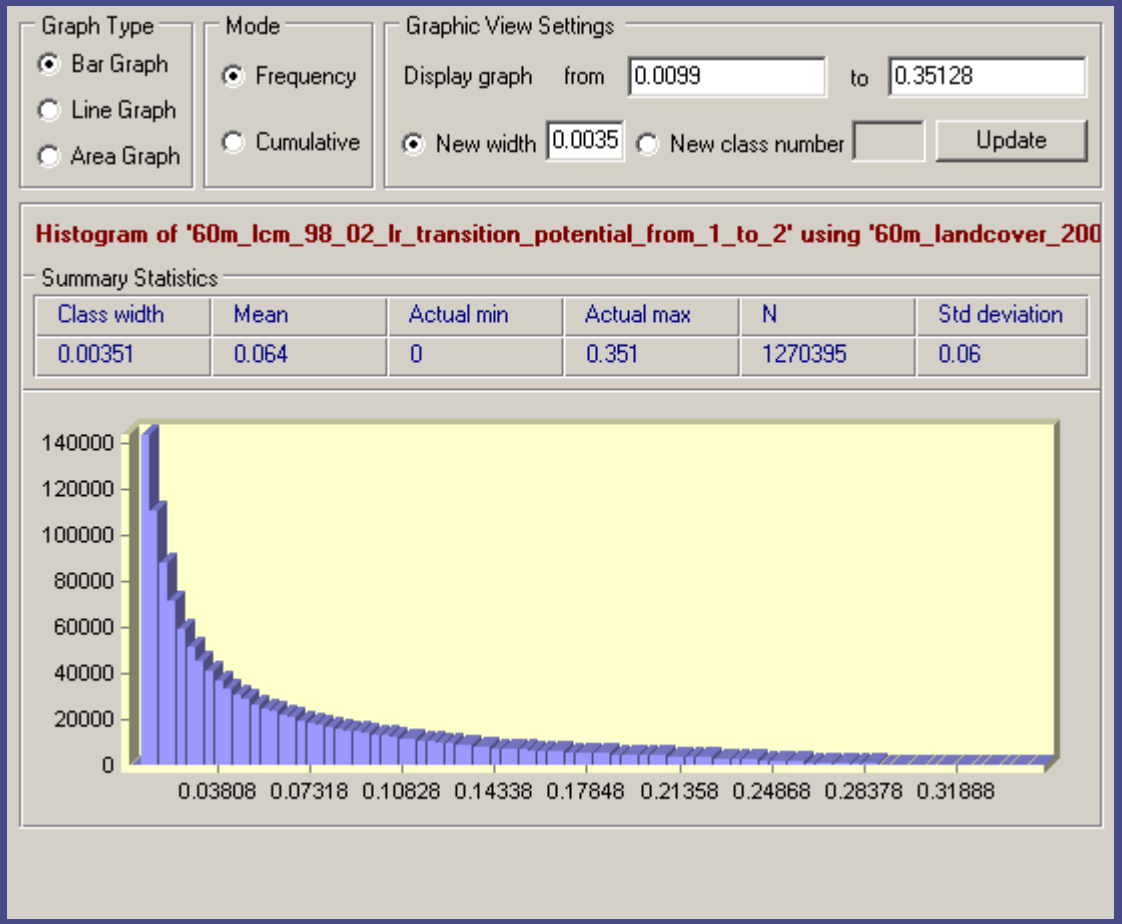
Transition Potential 2002



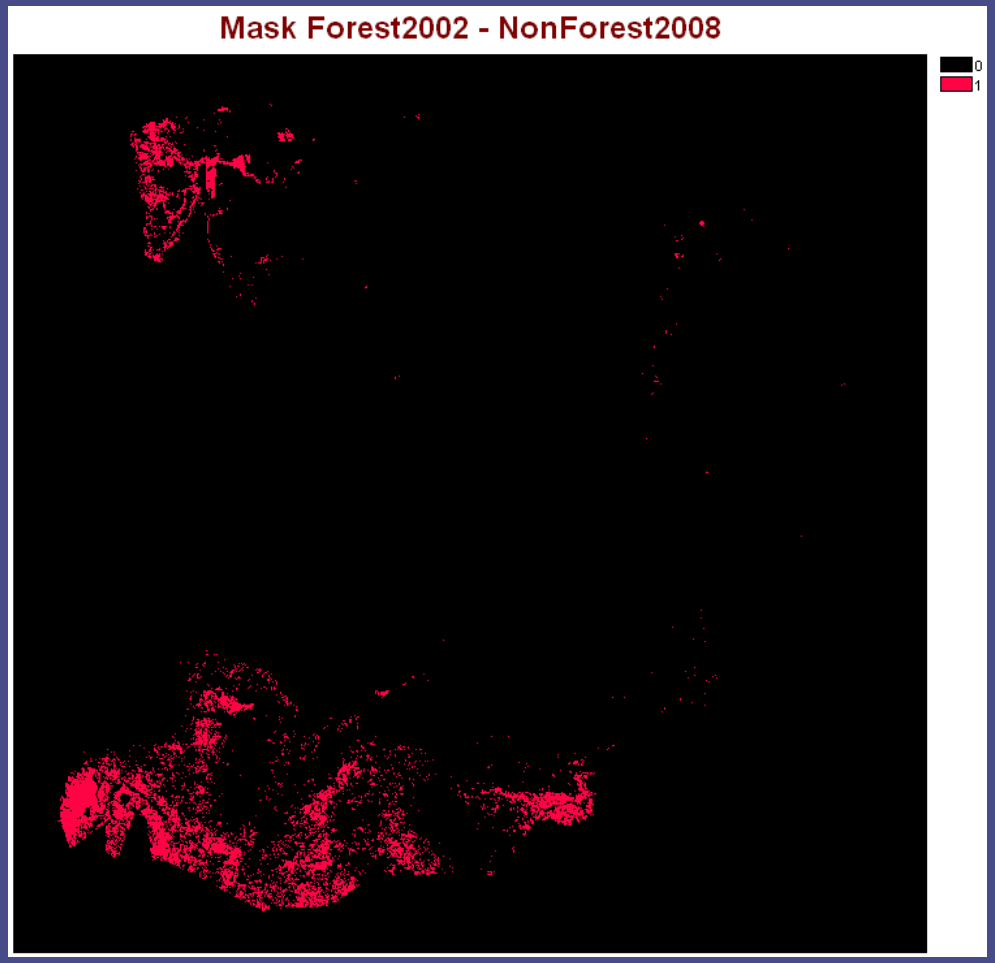
Validation – Histogram

Persistence 2002 – 2008 vs. Transition Potential



ROC – Relative Operating Characteristic

Forest 2002 – Non Forest 2008



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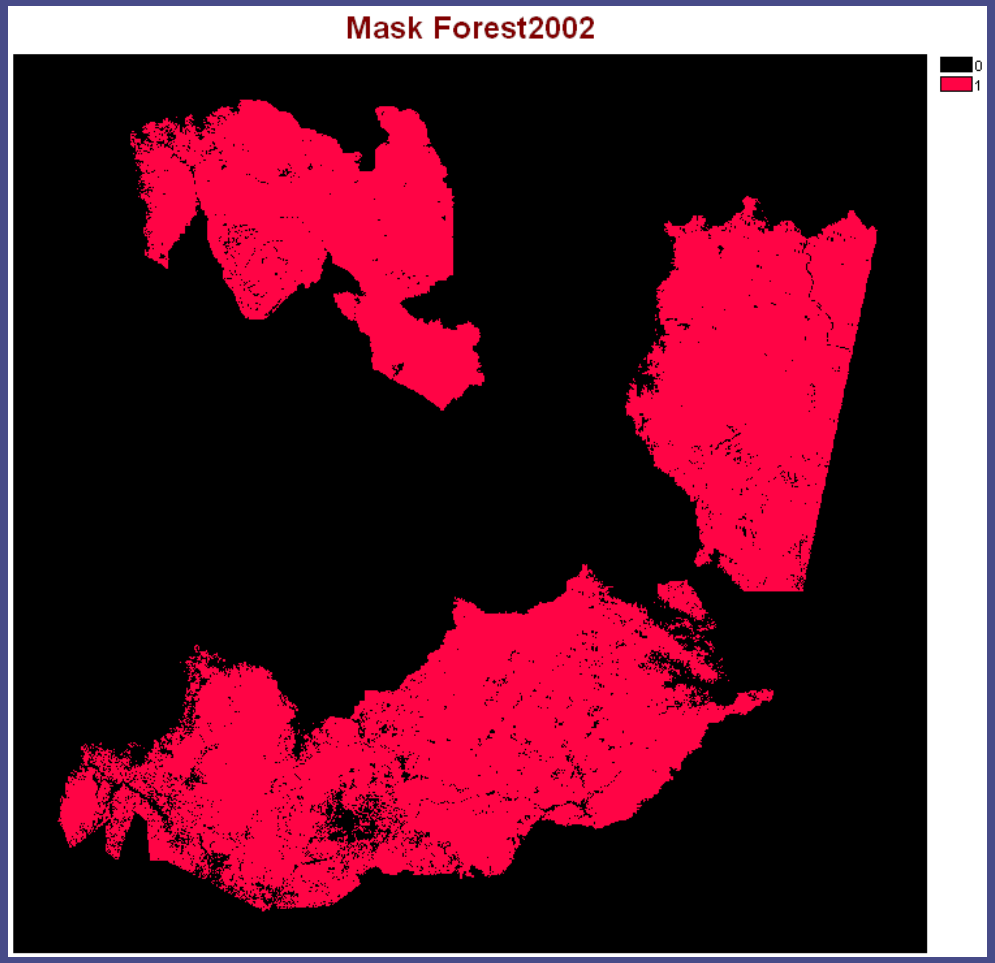

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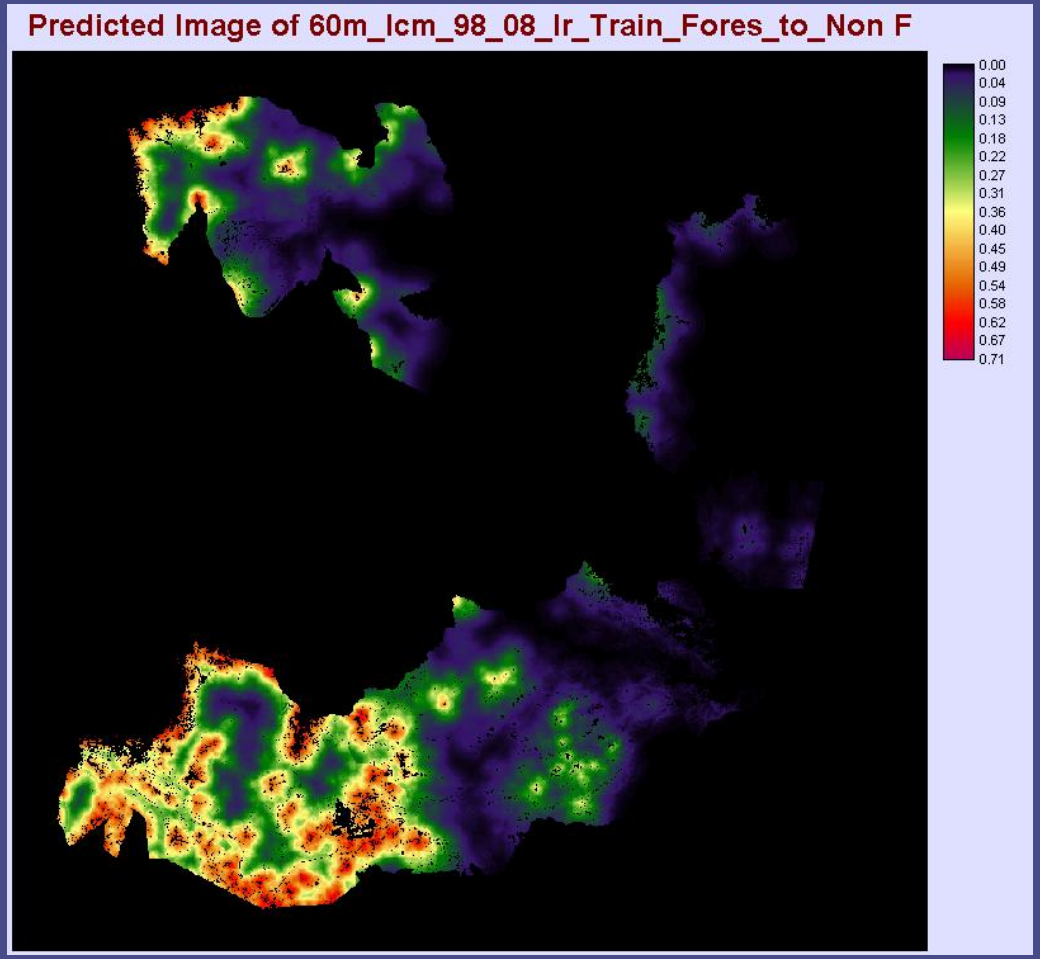

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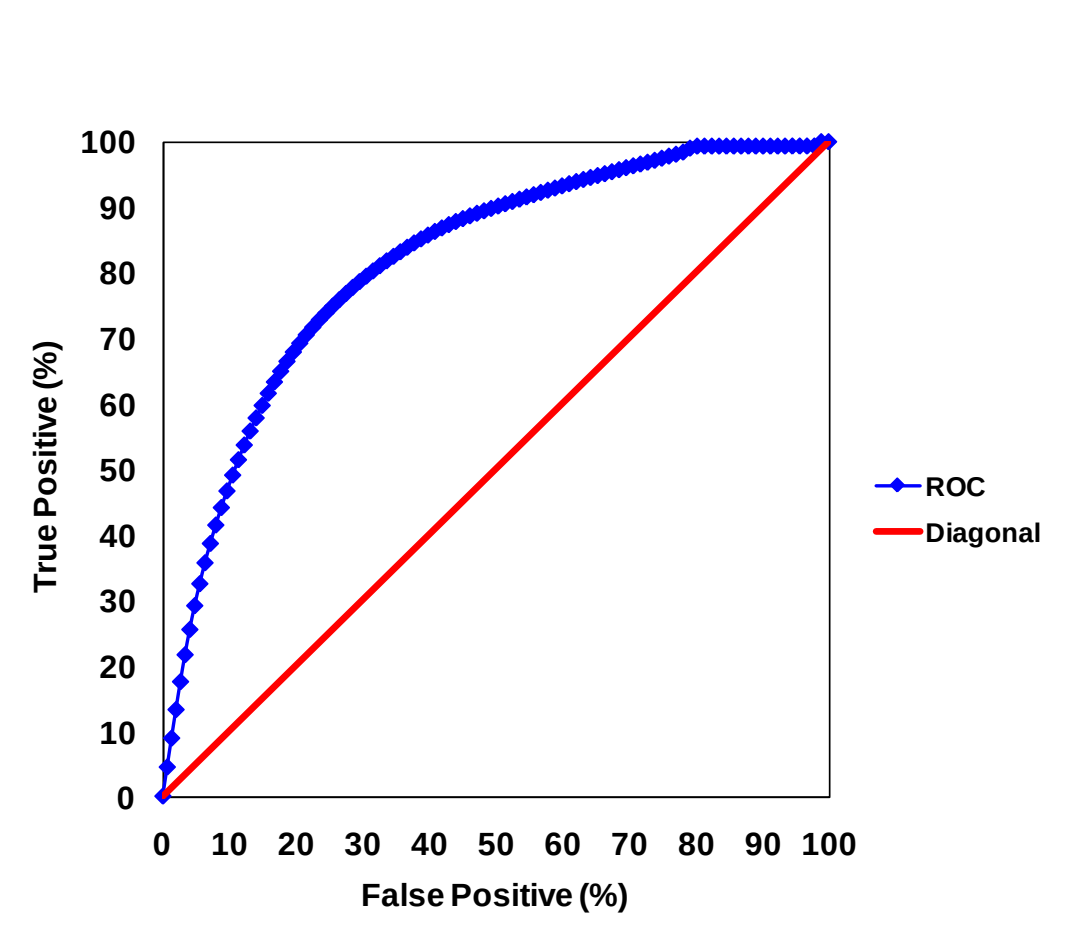
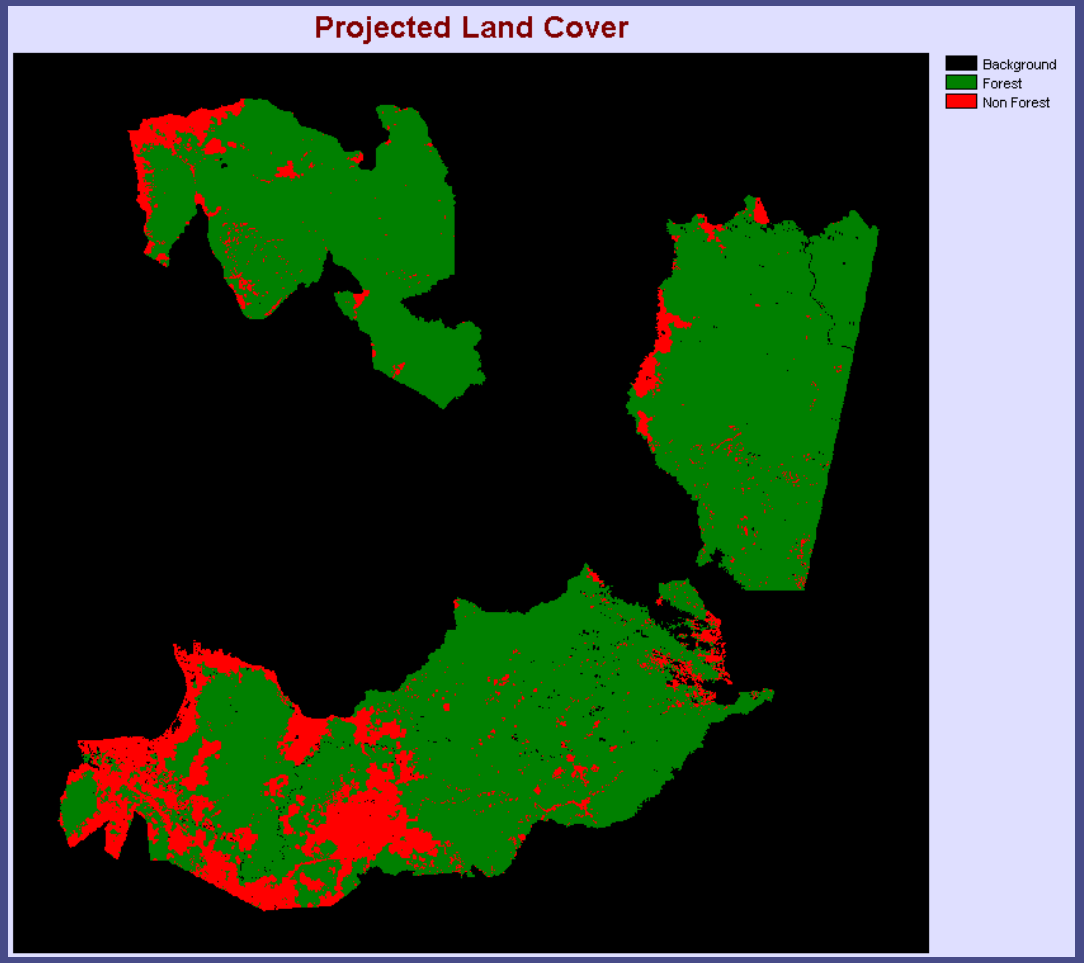


AUC – Area Under the Curve

Side by Side Comparison – MLP & LR

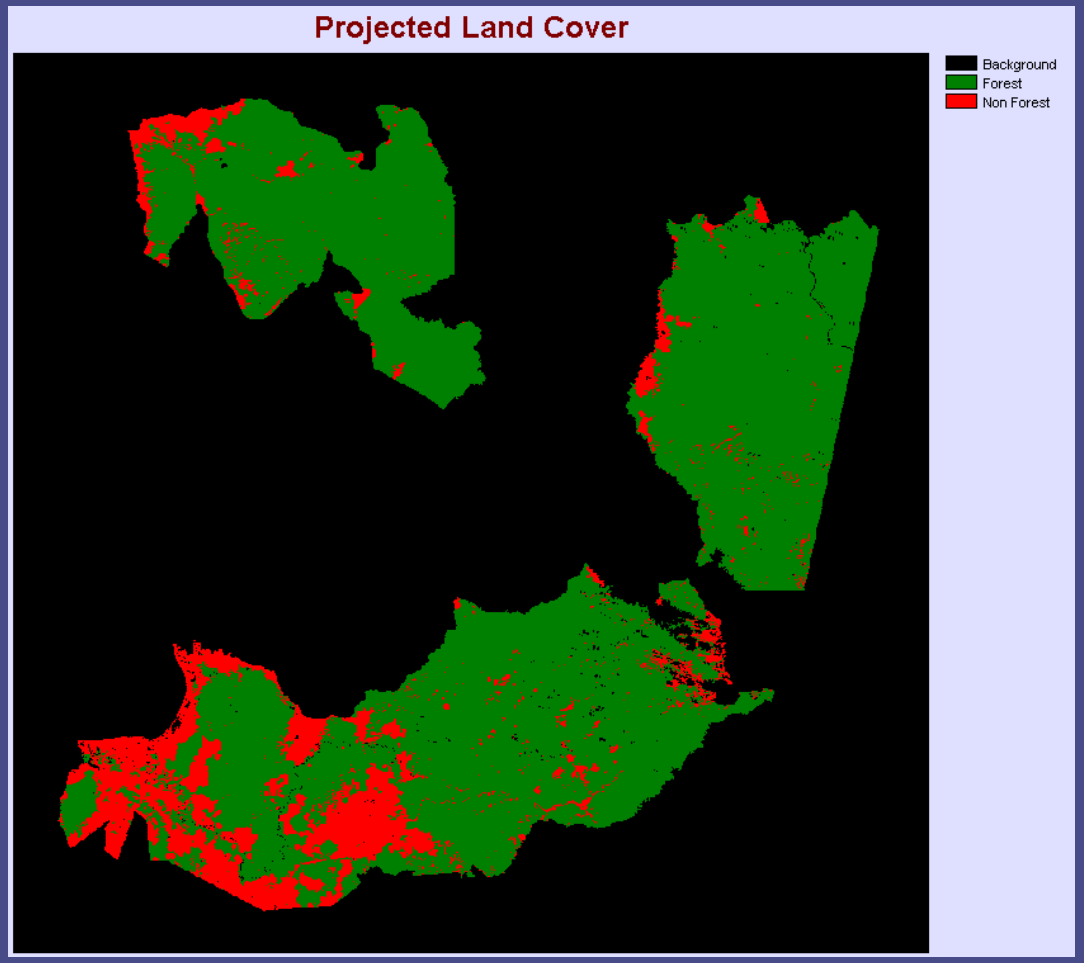
Prediction - Hard

Multi-Layer Perceptron



Prediction - Hard

Logistic Regression



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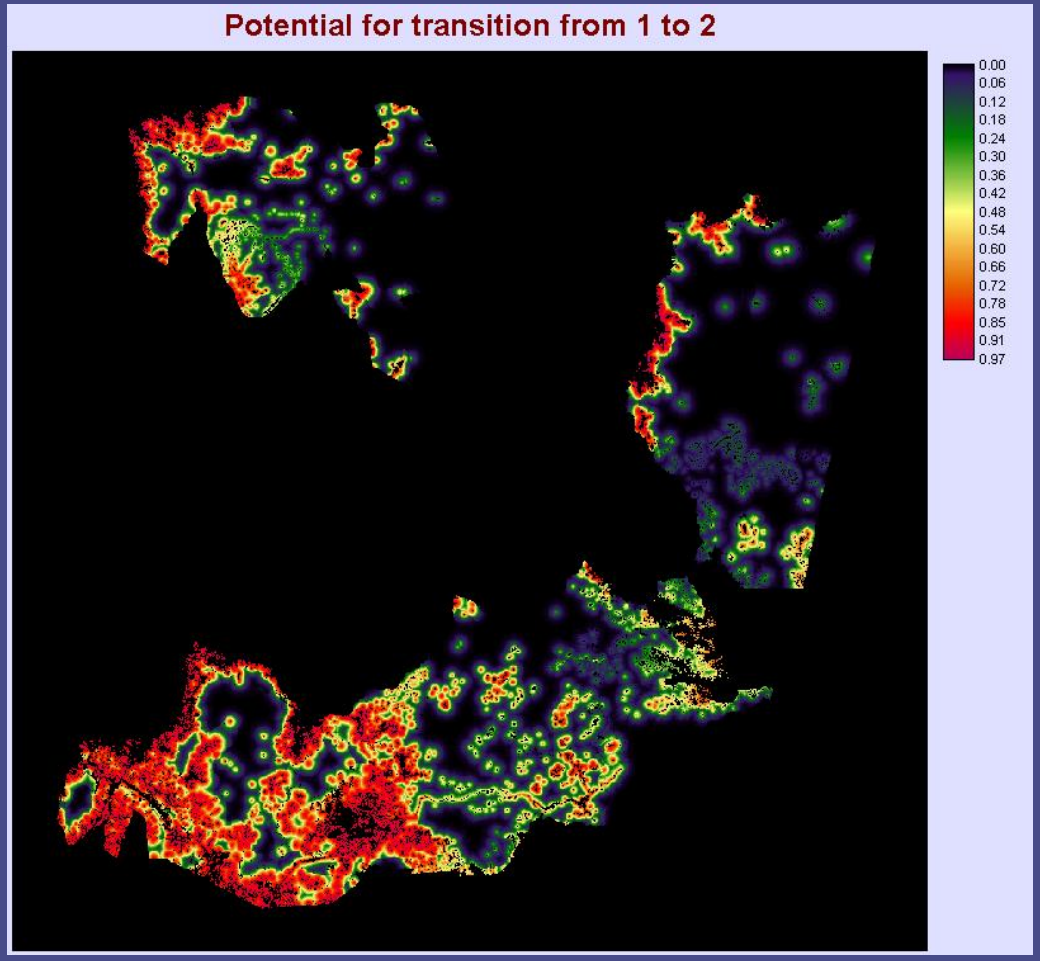
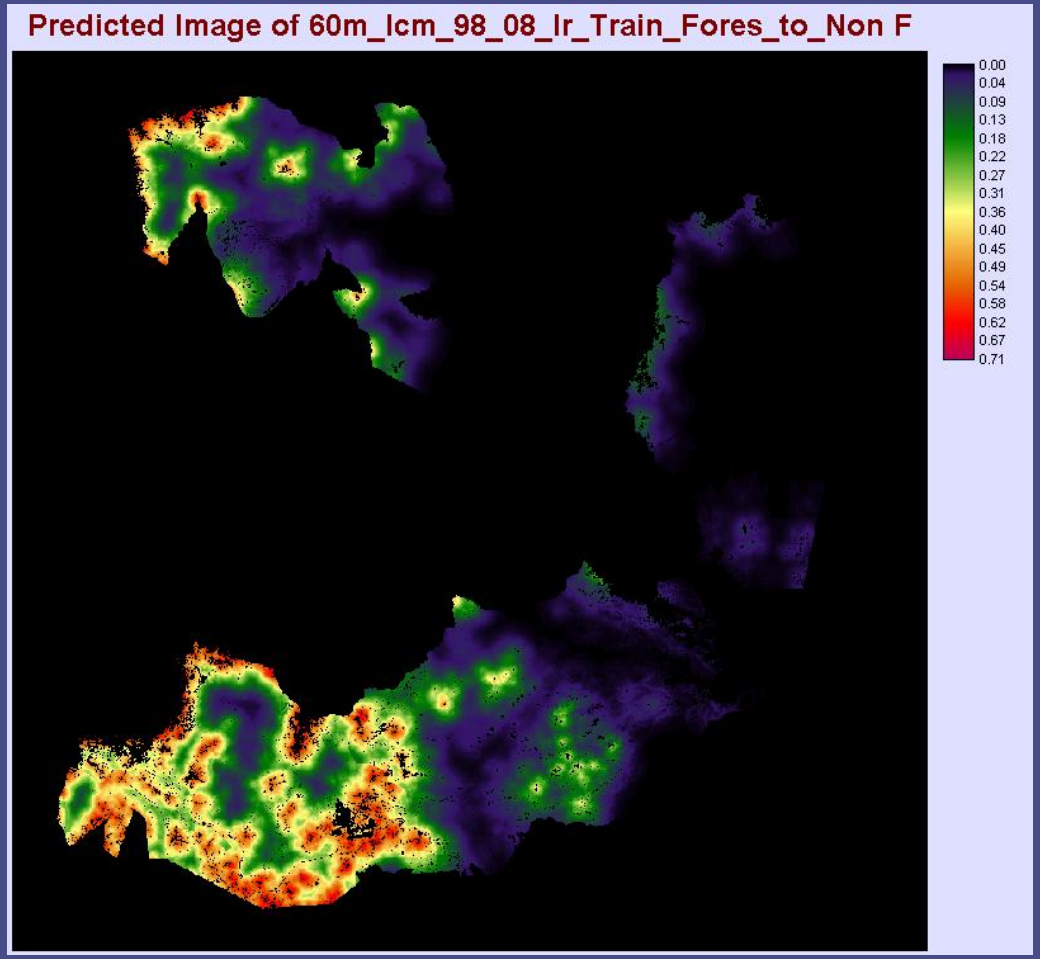


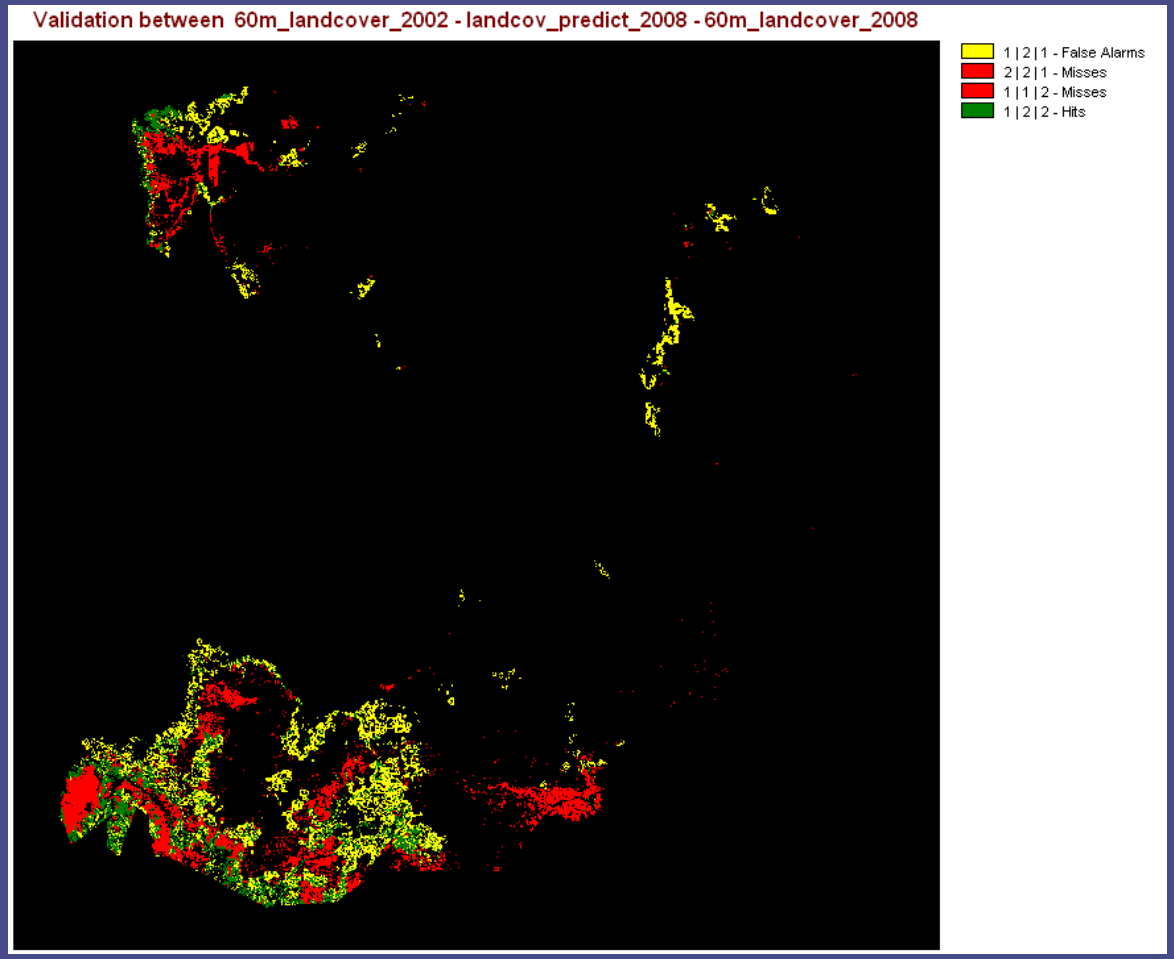
Transition Potential - LR

Logistic Regression



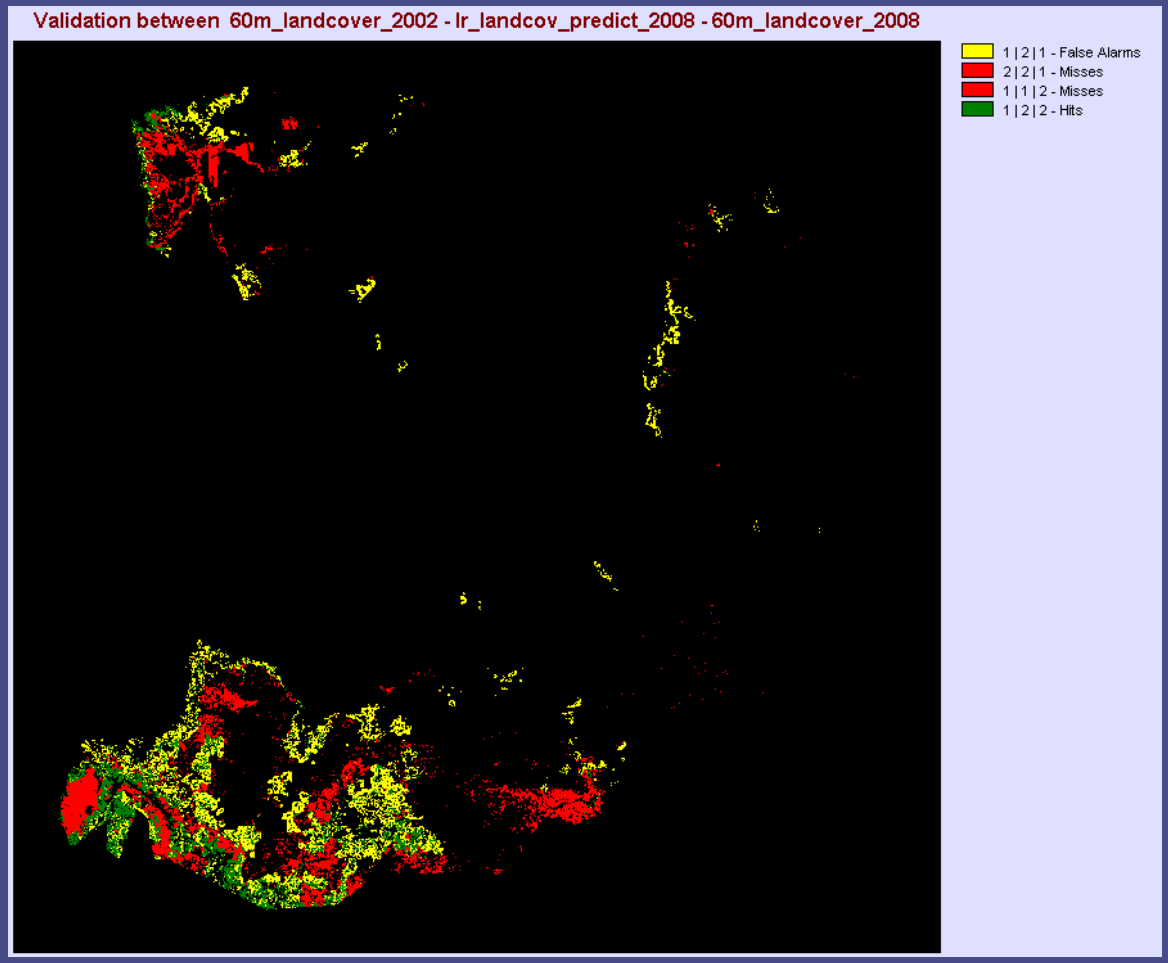
Validation - Crosstabulation

Multi-Layer Perceptron



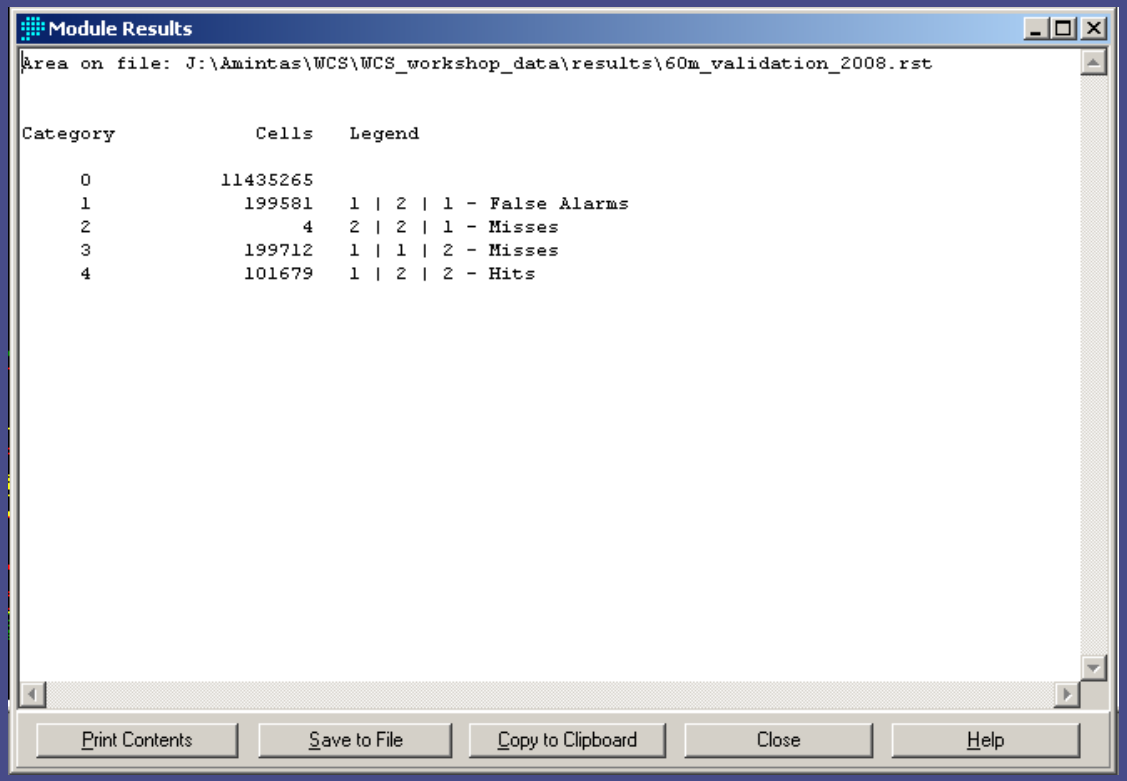
Validation - Crosstabulation

Logistic Regression



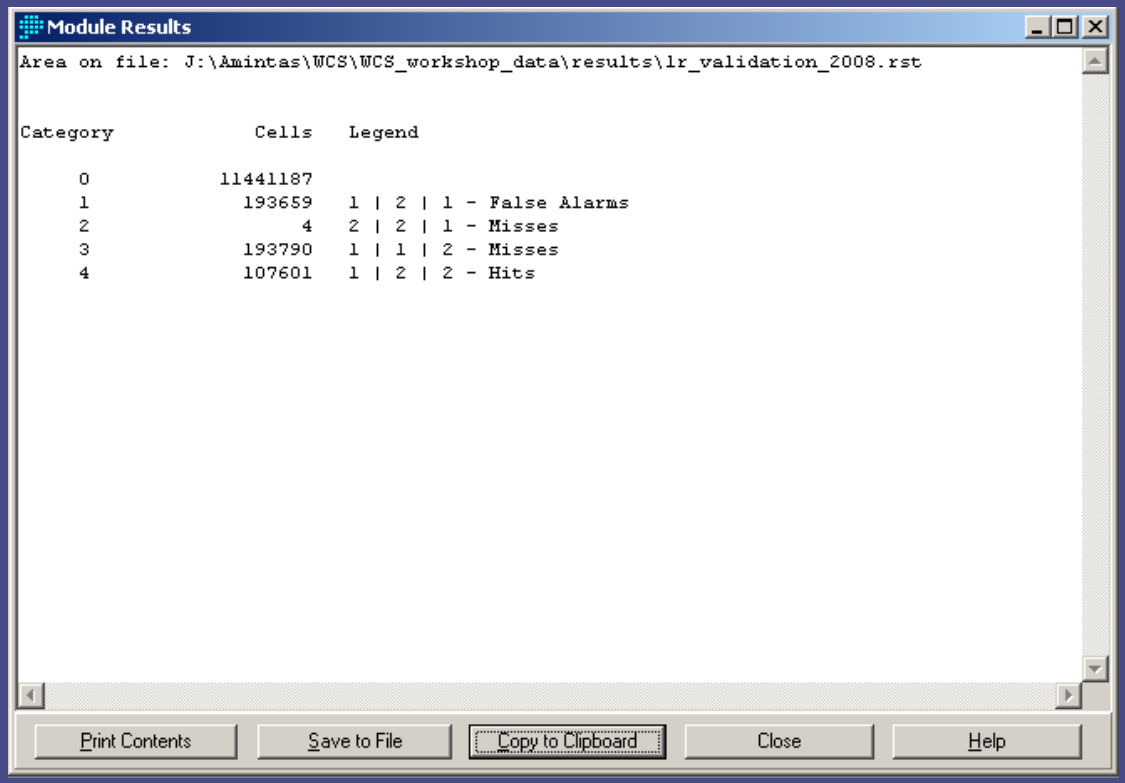
Validation – Area

Multi-Layer Perceptron

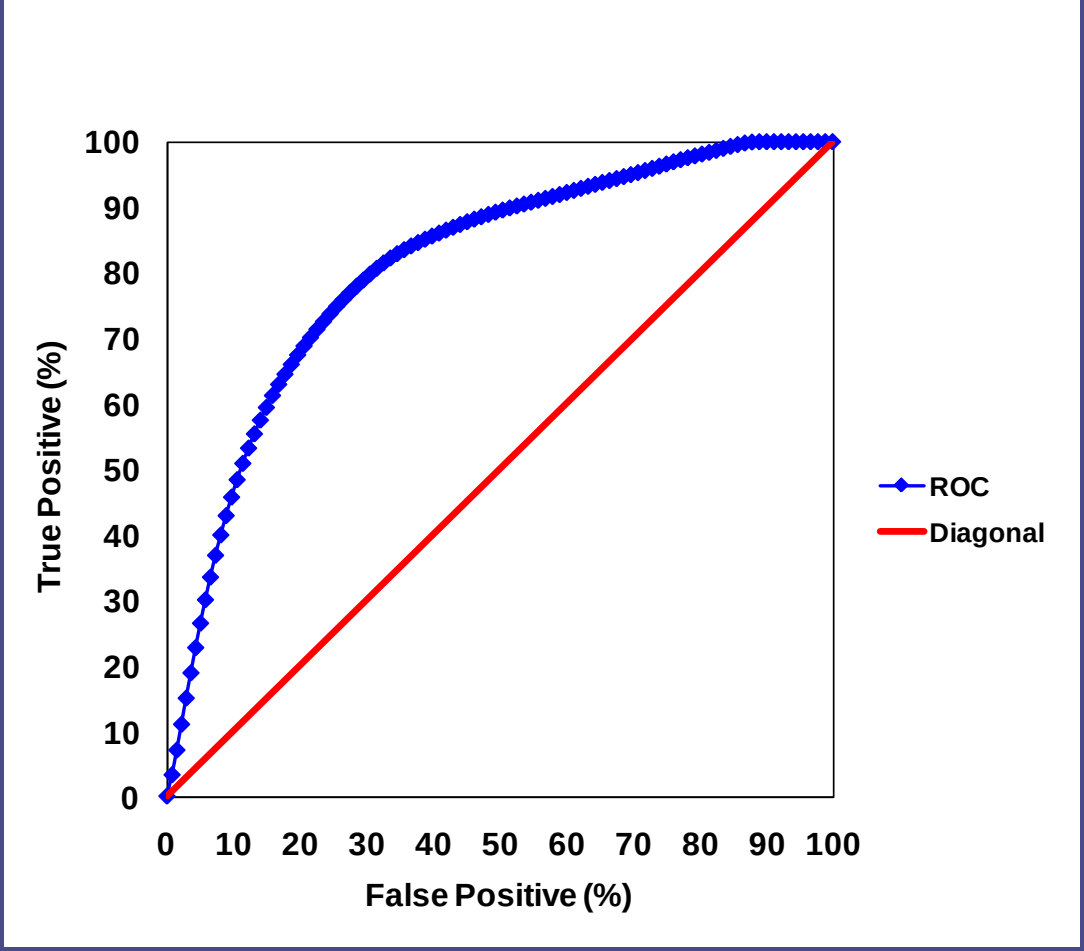


Validation – Area

Logistic Regression

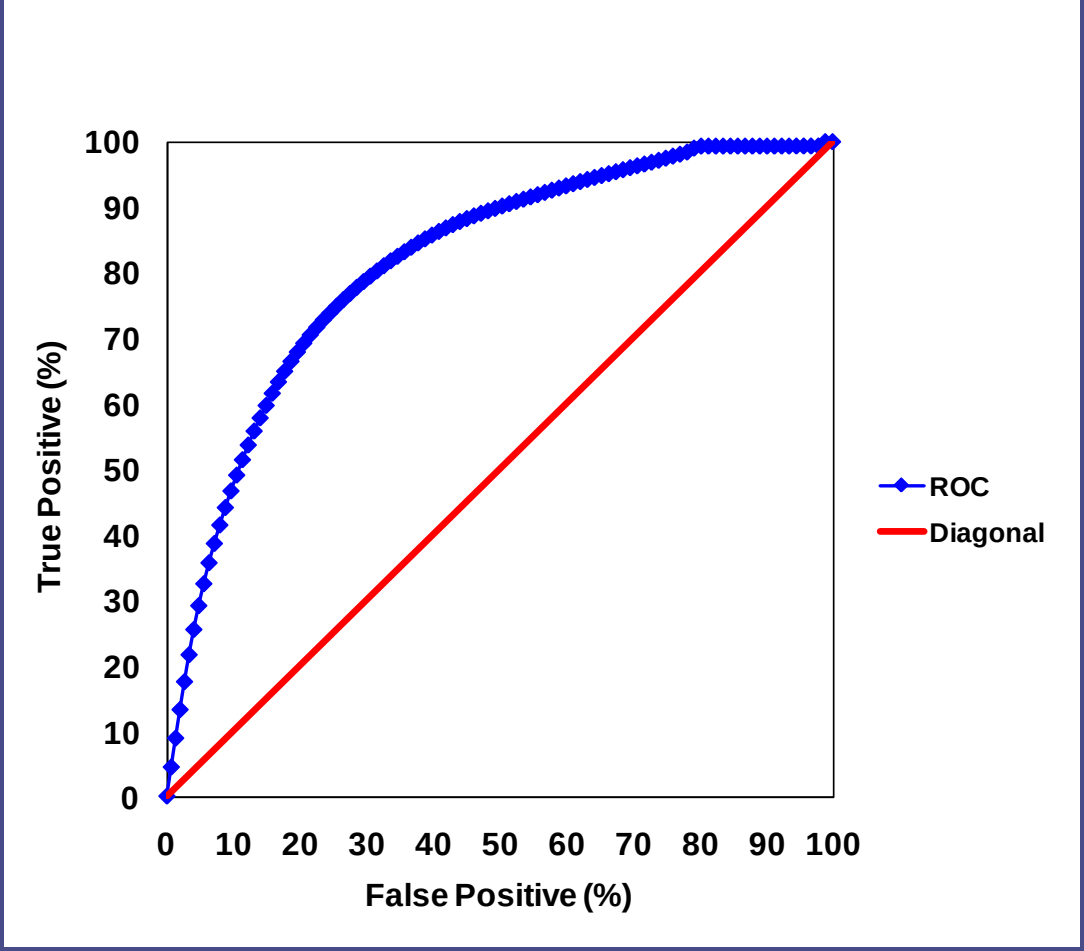


ROC – Multy-Layer Perceptron



AUC – Area Under the Curve

ROC – Logistic Regression



AUC – Area Under the Curve