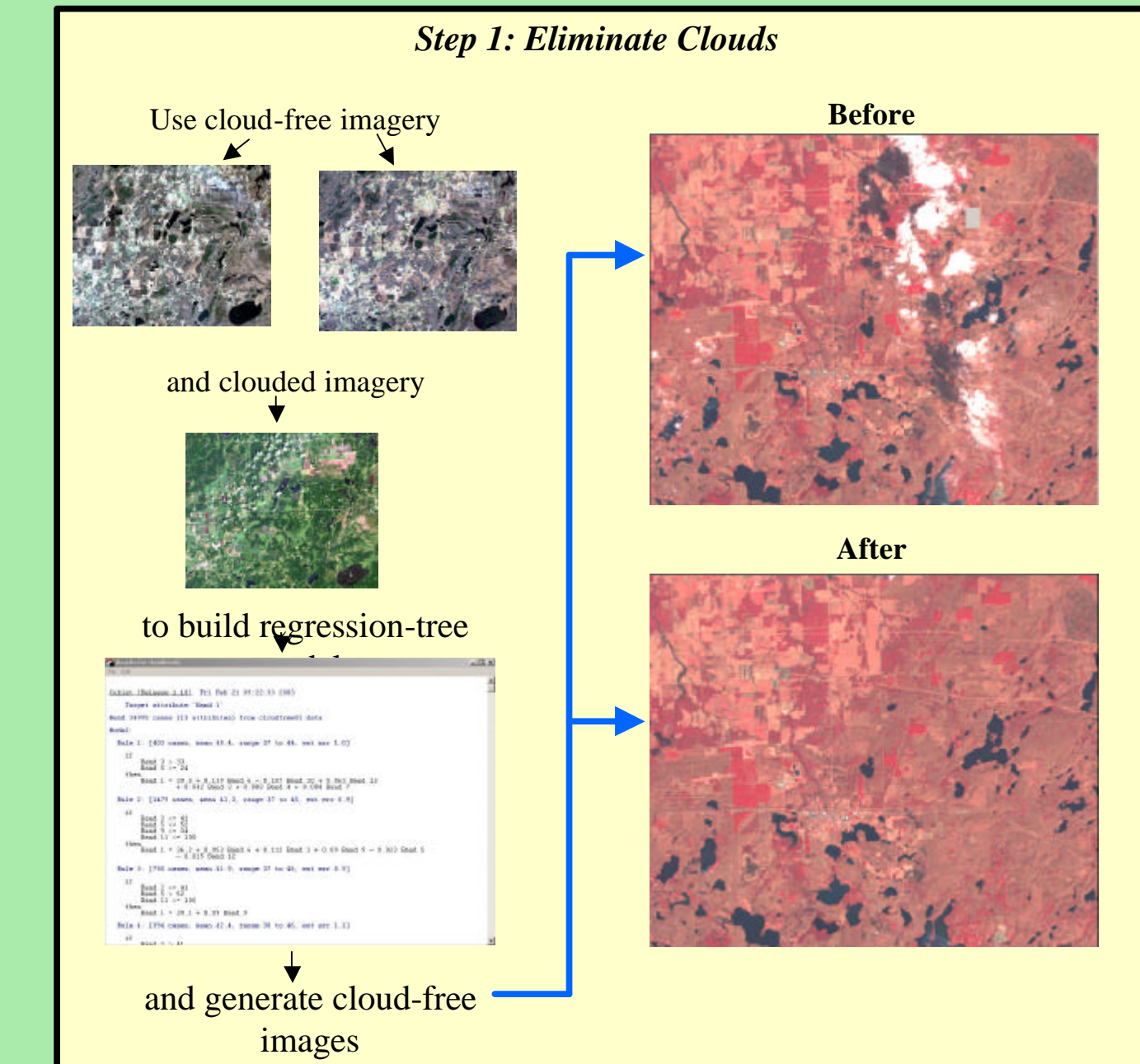




# ANALYSIS OF CANOPY COVER AND IMPERVIOUS SURFACE COVER FOR USGS ZONE 41 USING REGRESSION-TREES AND ERDAS IMAGINE



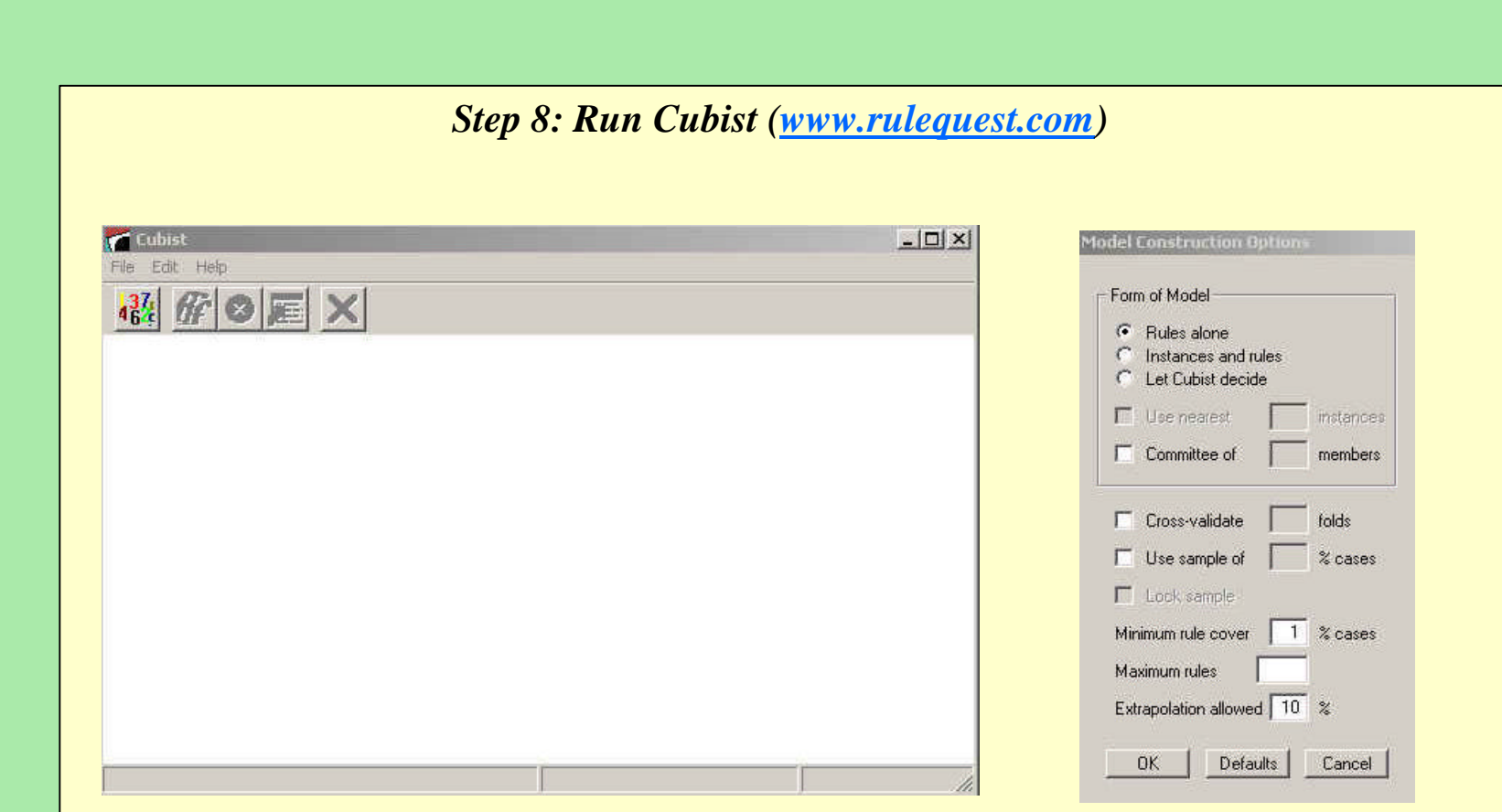
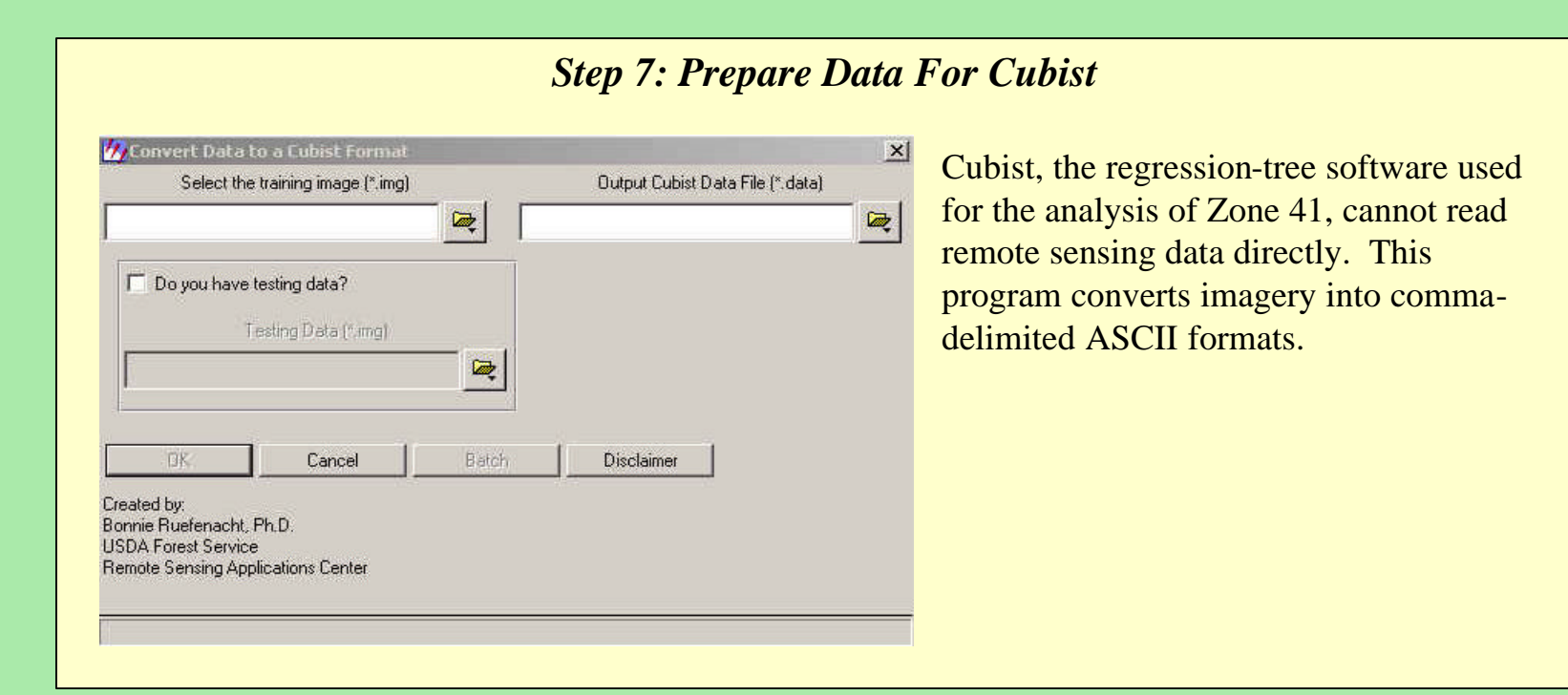
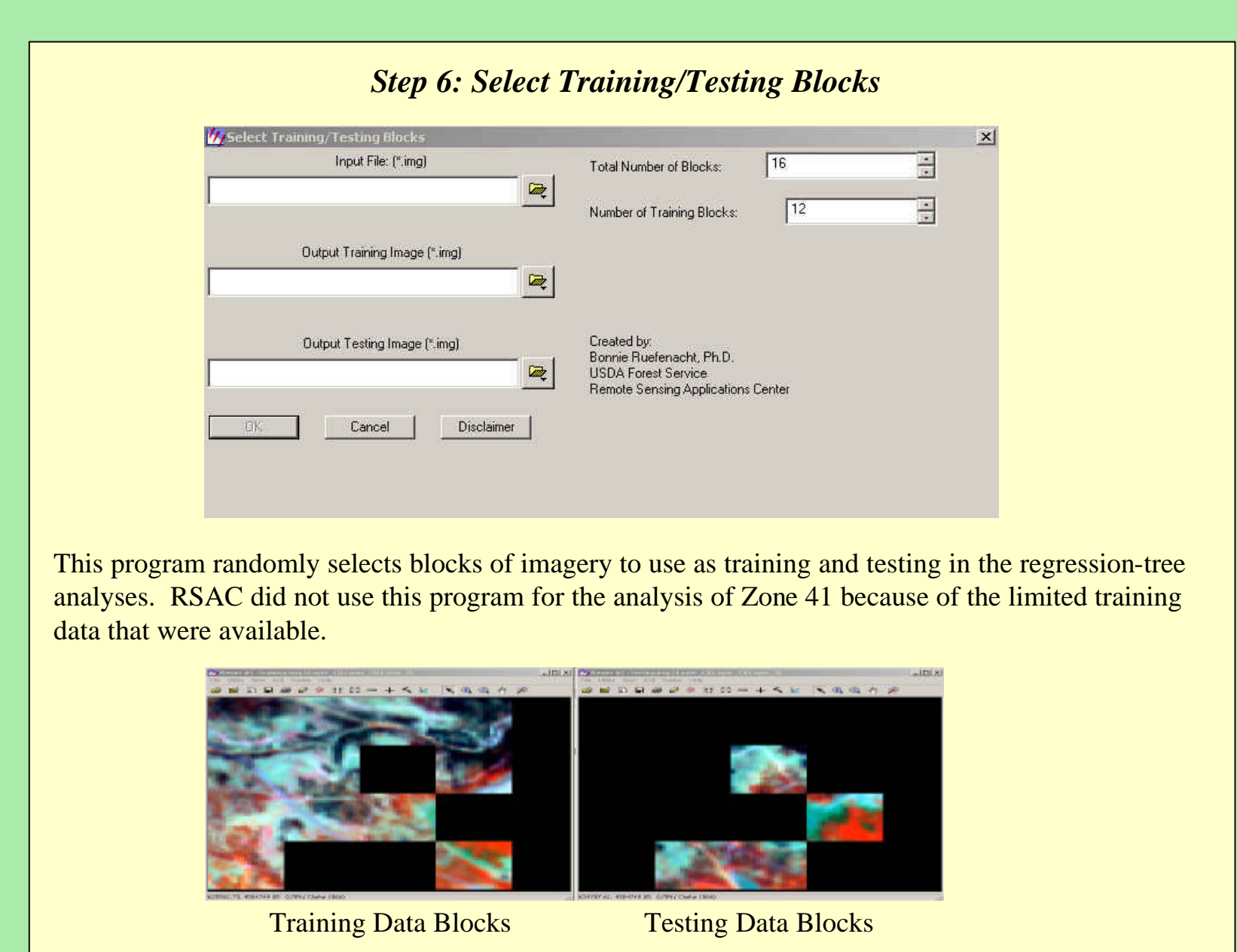
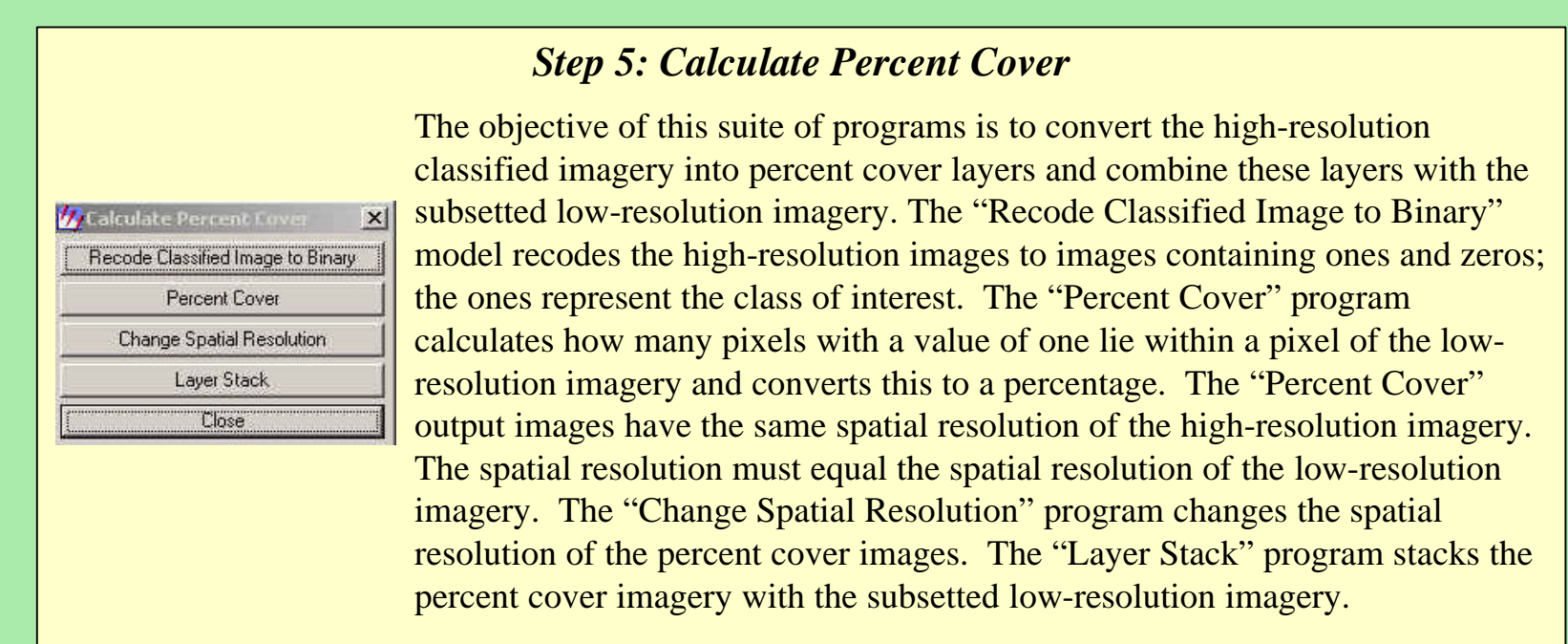
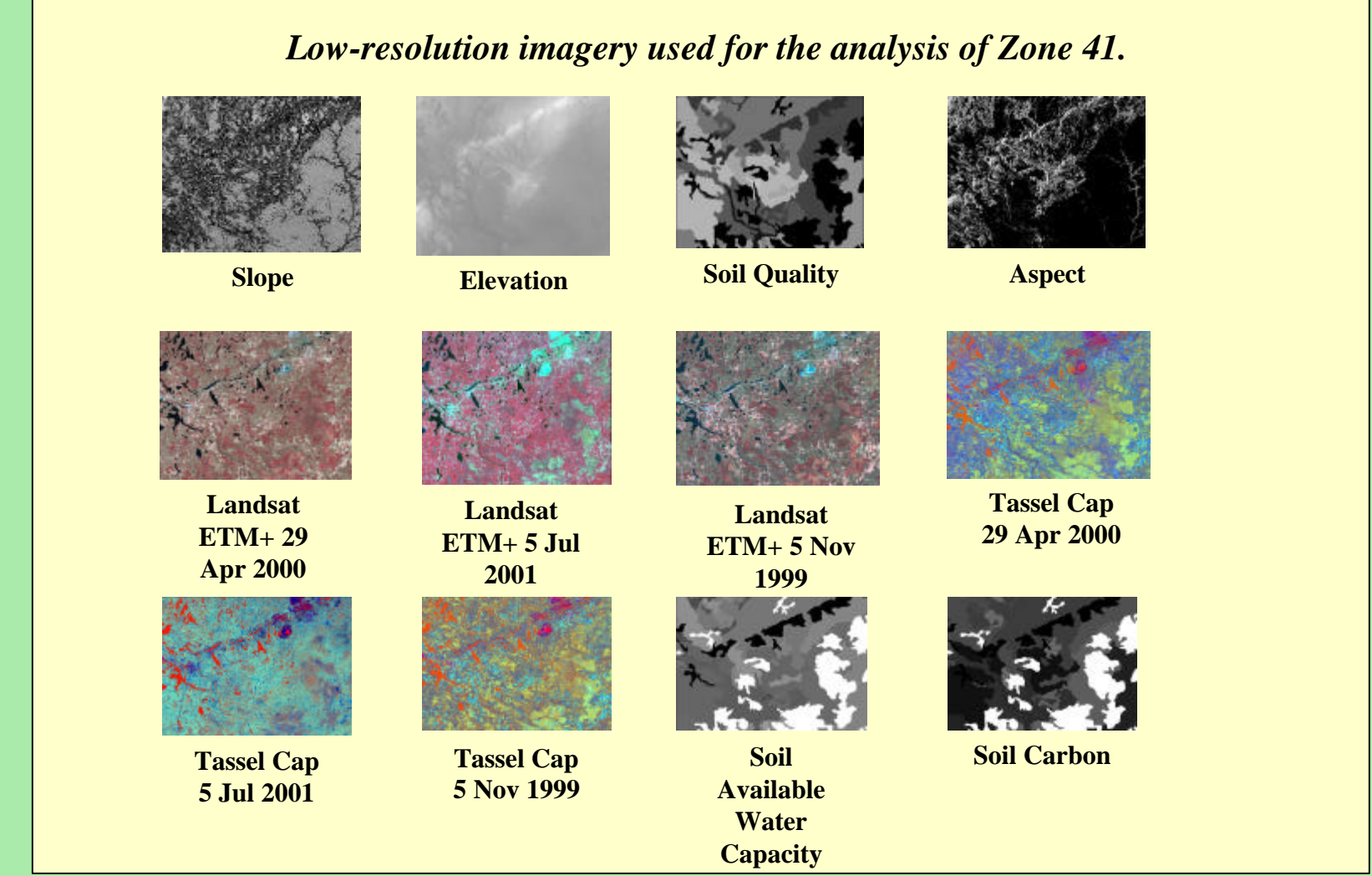
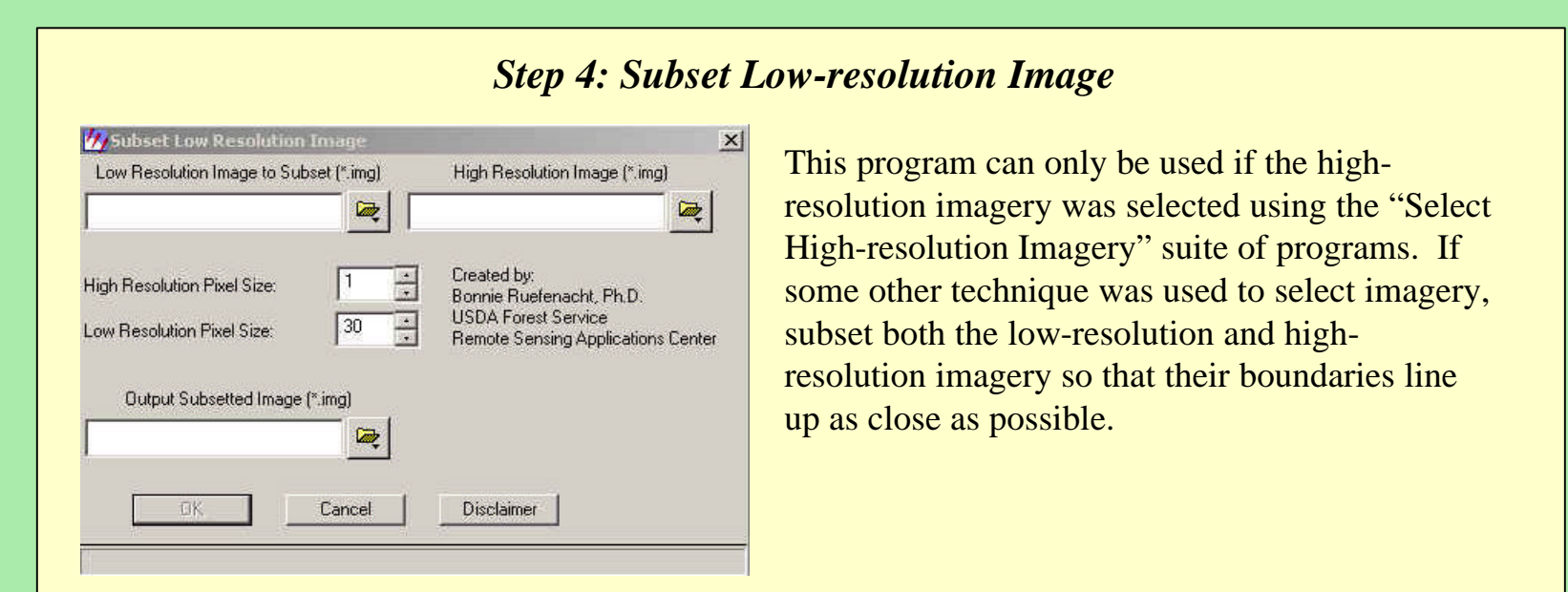
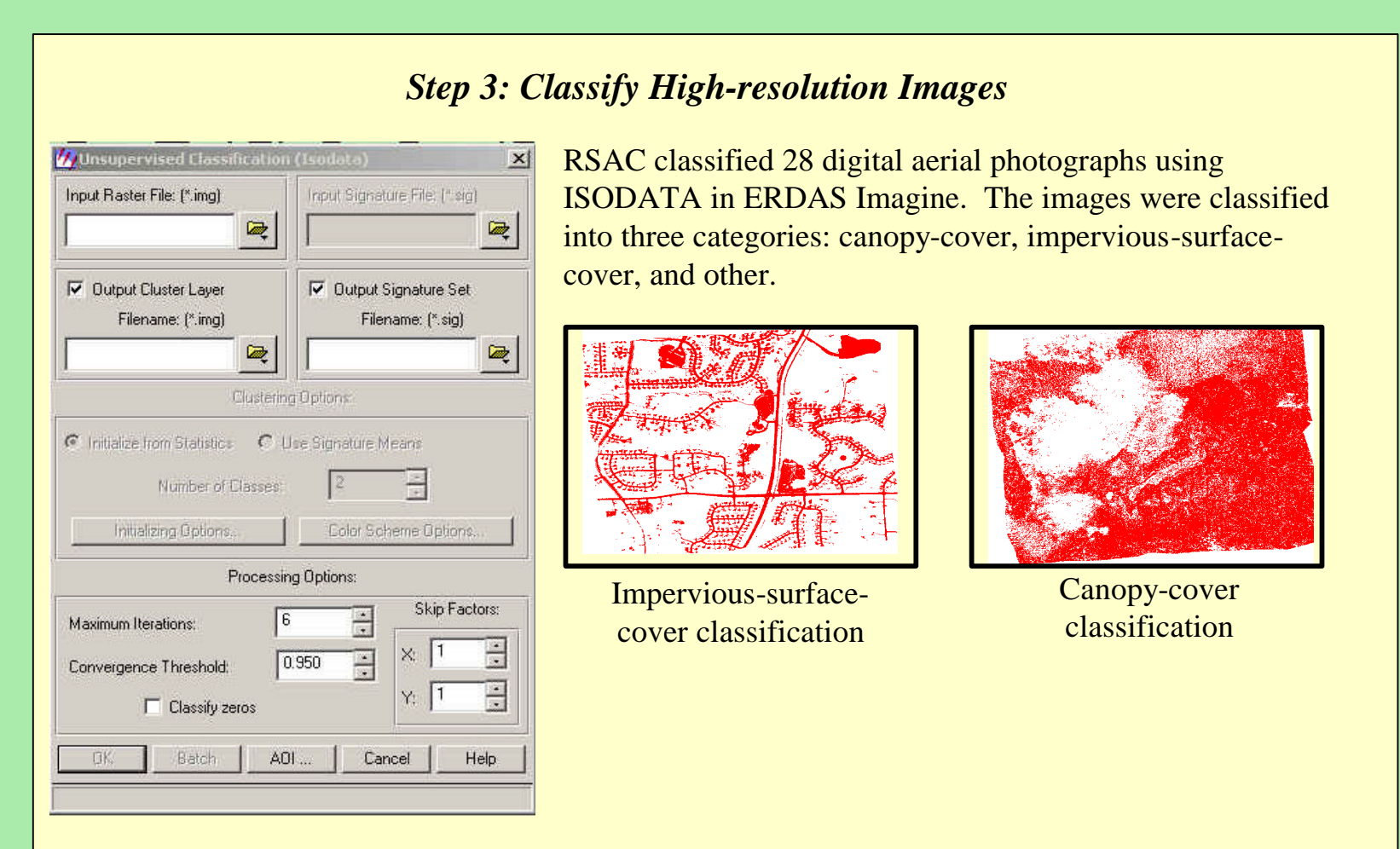
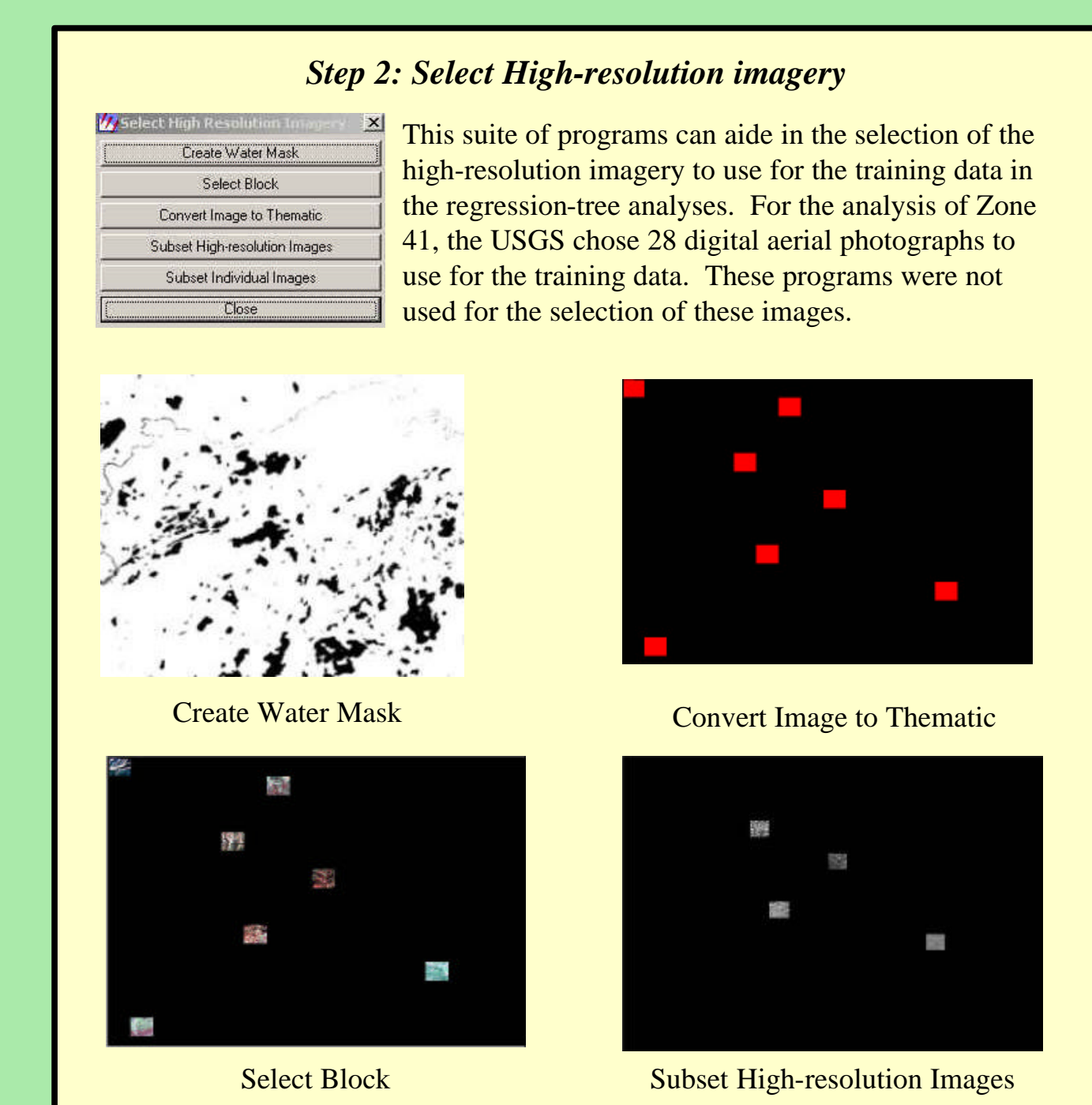
**Abstract**  
 Classification of satellite imagery, such as Landsat Enhanced Thematic Mapper (ETM+), is typically achieved through unsupervised and supervised classification techniques. While these techniques can be highly accurate, they can be time consuming and expensive to perform over large areas. Classifying large areas using regression tree analysis with a variety of imagery yields highly accurate results in a short time and is inexpensive to perform. The Remote Sensing Applications Center (RSAC) used Cubist ([www.rulequest.com](http://www.rulequest.com)) and a suite of Leica-Geosystems ERDAS Imagine programs developed at RSAC to classify the US Geological Survey (USGS) Zone 41 into percent canopy-cover and percent impervious-surface-cover.



**Accuracy**

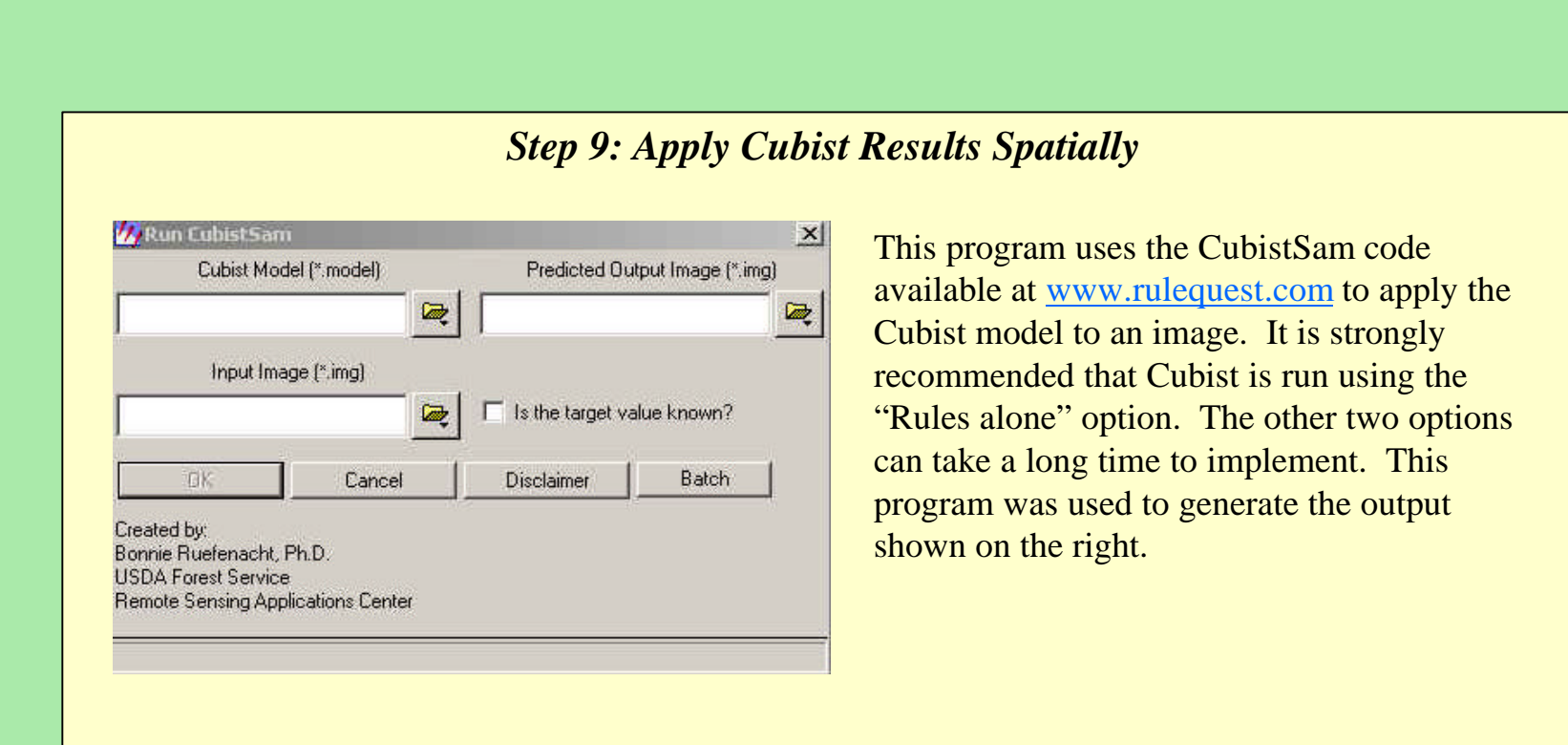
RSAC predicted the digital number values of a cloud-free image and compared the results with the original digital number values.

	Band 1	Band 2	Band 3	Band 4	Band 5	Band 7
Max. Difference	21	25	25	31	60	32
Min. Difference	-14	-23	-23	-53	-77	-55
Mode	0	0	0	0	-1	0
Median	0	0	0	0	1	0
Mean Difference	0.176	0.038	0.037	-0.118	0.758	0.435
St. Dev.	1.915	2.787	2.778	4.678	6.656	4.820



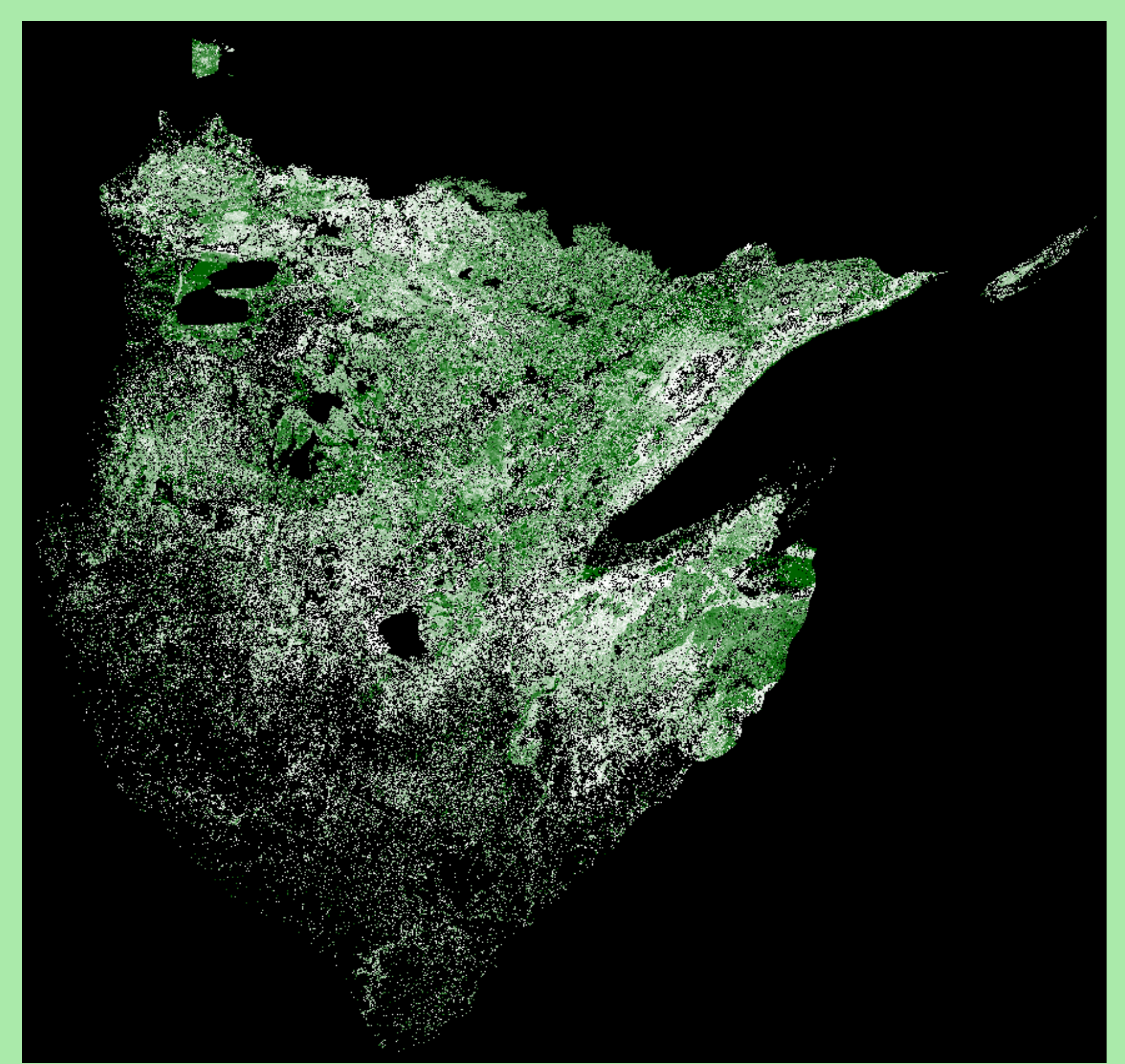
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Cubist [Release 1.10] Fri Feb 21 09:22:33 2003
Target attribute "Band 1"
Read 34995 cases (13 attributes) from cloudfree01.data
Model:
Rule 1: [403 cases, mean 40.4, range 37 to 44, est err 1.0]
if
  Band 3 > 32
  Band 5 <= 24
then
  Band 1 = 39.5 + 0.129 Band 6 + 0.187 Band 10 + 0.053 Band 13
  + 0.042 Band 3 + 0.008 Band 4 + 0.004 Band 7
Rule 2: [1479 cases, mean 41.3, range 37 to 45, est err 0.9]
if
  Band 2 <= 41
  Band 5 <= 52
  Band 9 <= 34
  Band 11 <= 100
then
  Band 1 = 36.2 + 0.053 Band 6 + 0.112 Band 3 + 0.09 Band 9 - 0.023 Band 5
Rule 3: [790 cases, mean 41.9, range 37 to 46, est err 0.9]
if
  Band 2 <= 41
  Band 5 <= 100
  Band 11 <= 100
then
  Band 1 = 39.1 + 0.09 Band 9
Rule 4: [294 cases, mean 42.4, range 38 to 46, est err 1.1]
if
  Band 3 <= 41
  
```

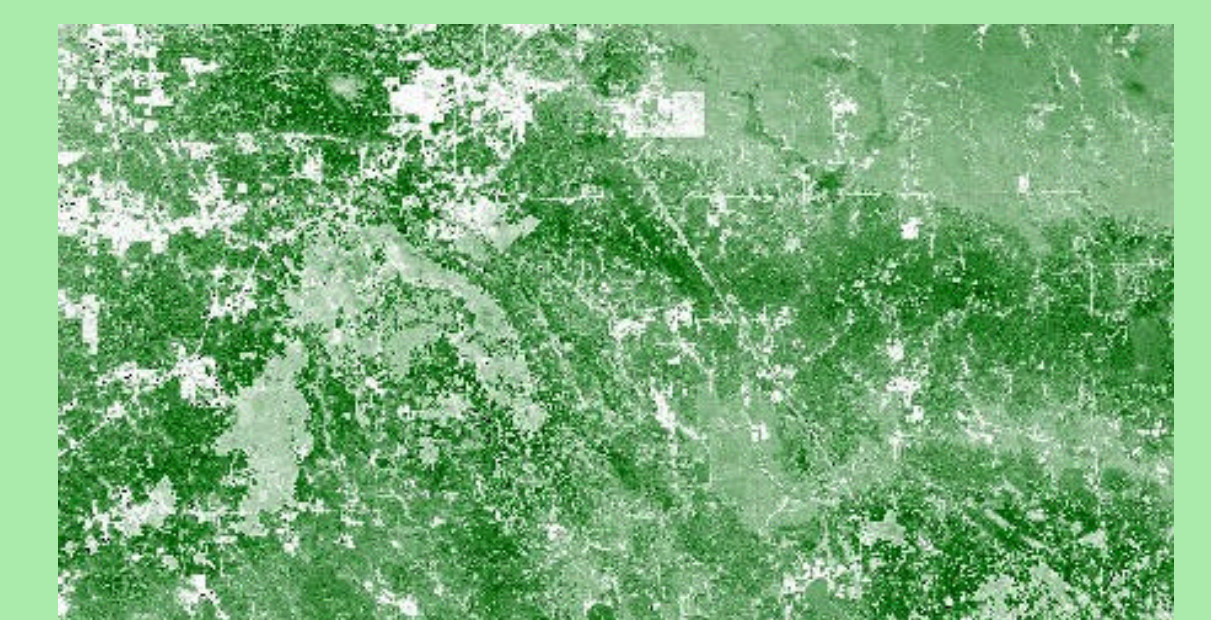


**Accuracy Assessment of the Percent Canopy-Cover and Percent Impervious-Surface-Cover Analysis of Zone 41**

To assess the accuracy of the models, RSAC did a 10-fold cross validation using Cubist. A 10-fold cross validation technique divides the data into 10 equal groups. With each iteration, nine groups are used to build models and the remaining group is used to test the models. At the end of each iteration, error rates and correlation coefficients are calculated. At the end of the 10-fold cross validation, the error rates and correlation coefficients are averaged. These averages are nearly unbiased predictors of the true error rates and true correlation coefficients of the model built with all the data. The 10-fold cross validation for the percent canopy cover model had an average error of 14.5, relative error of 0.55, and correlation coefficient of 0.77. The 10-fold cross validation for the percent impervious surface cover analysis had an average error of 4.6, relative error of 0.36, and correlation coefficient of 0.82.

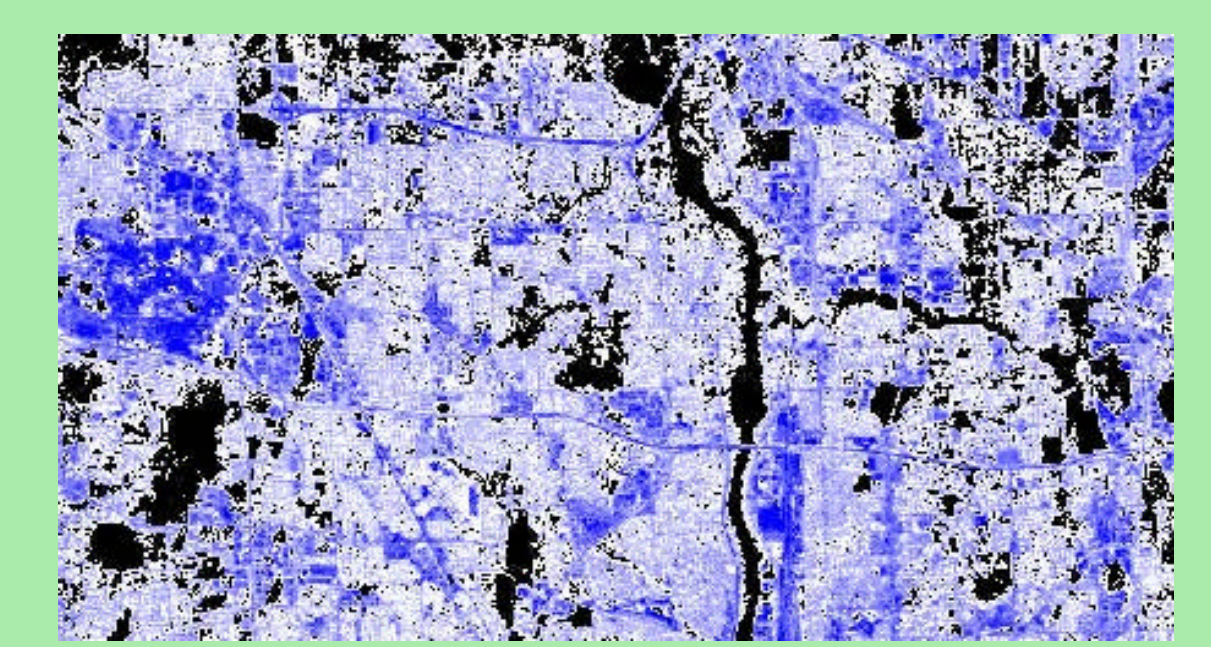


Percent Canopy-Cover For Zone 41

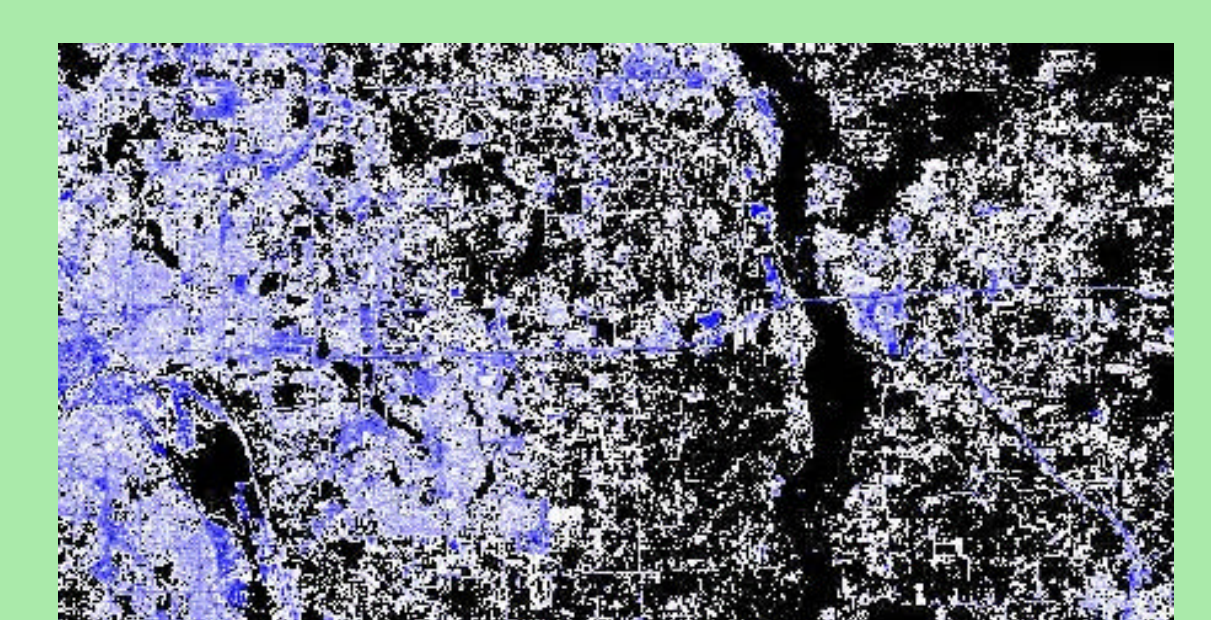


Percent Canopy-Cover For Zone 41

Percent Canopy-Cover For Zone 41



Percent Impervious-Surface-Cover For Zone 41



Percent Impervious-Surface-Cover For Zone 41

Percent Impervious-Surface-Cover For Zone 41

**Acknowledgements**

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