

Using ASTER and Landsat data to
Map vegetation and land use
around active and proposed mines
in Alaska

Russ Kirkham

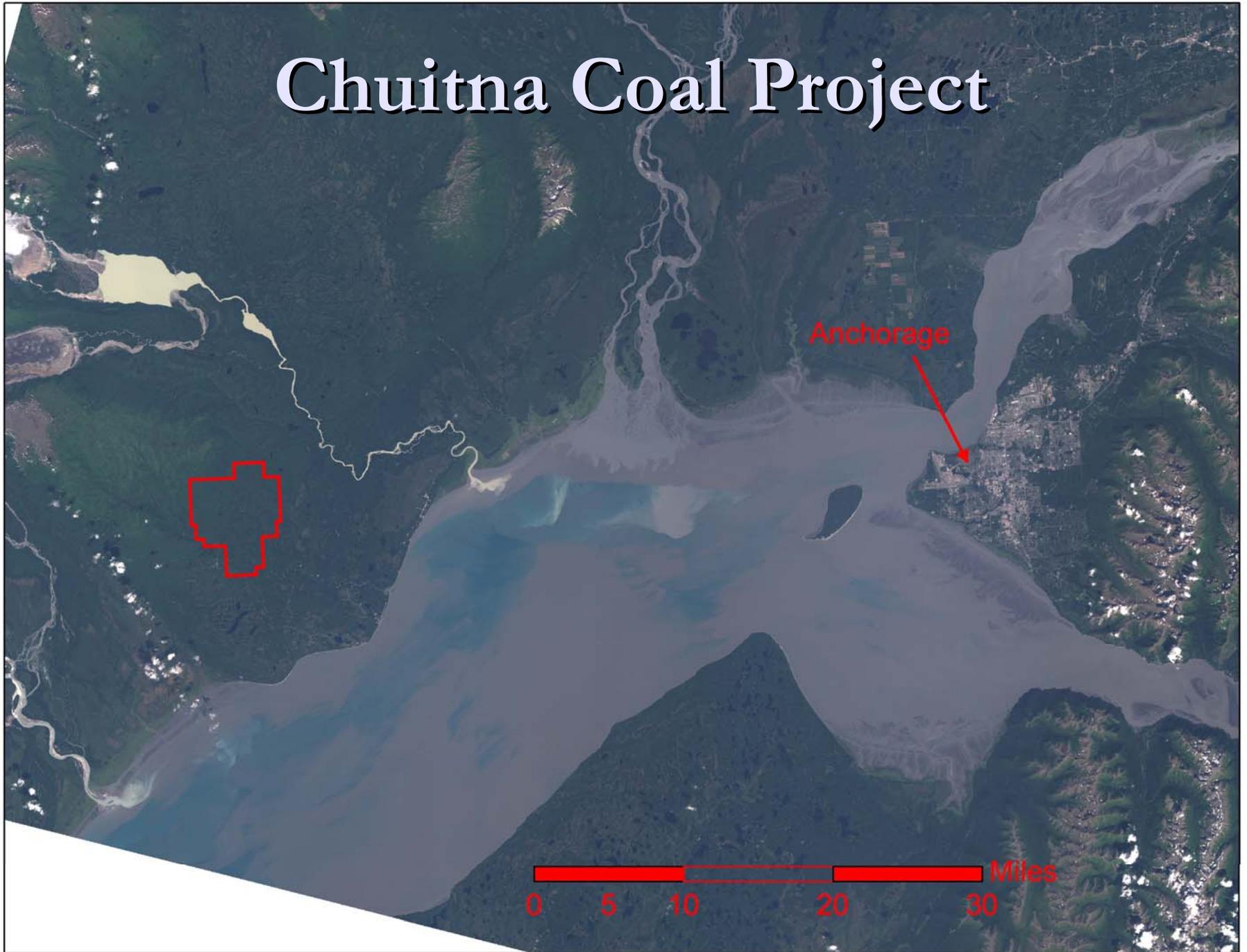
AK Div of Mining, Land and Water

WRTT Conference, Bismarck ND

Outline

- Introduction, Chuitna Coal Project
- Landsat 7 Data
- Image Classification
- Spectral Response
- Unsupervised and Supervised Classification
- Other uses of Remote Sensing Data

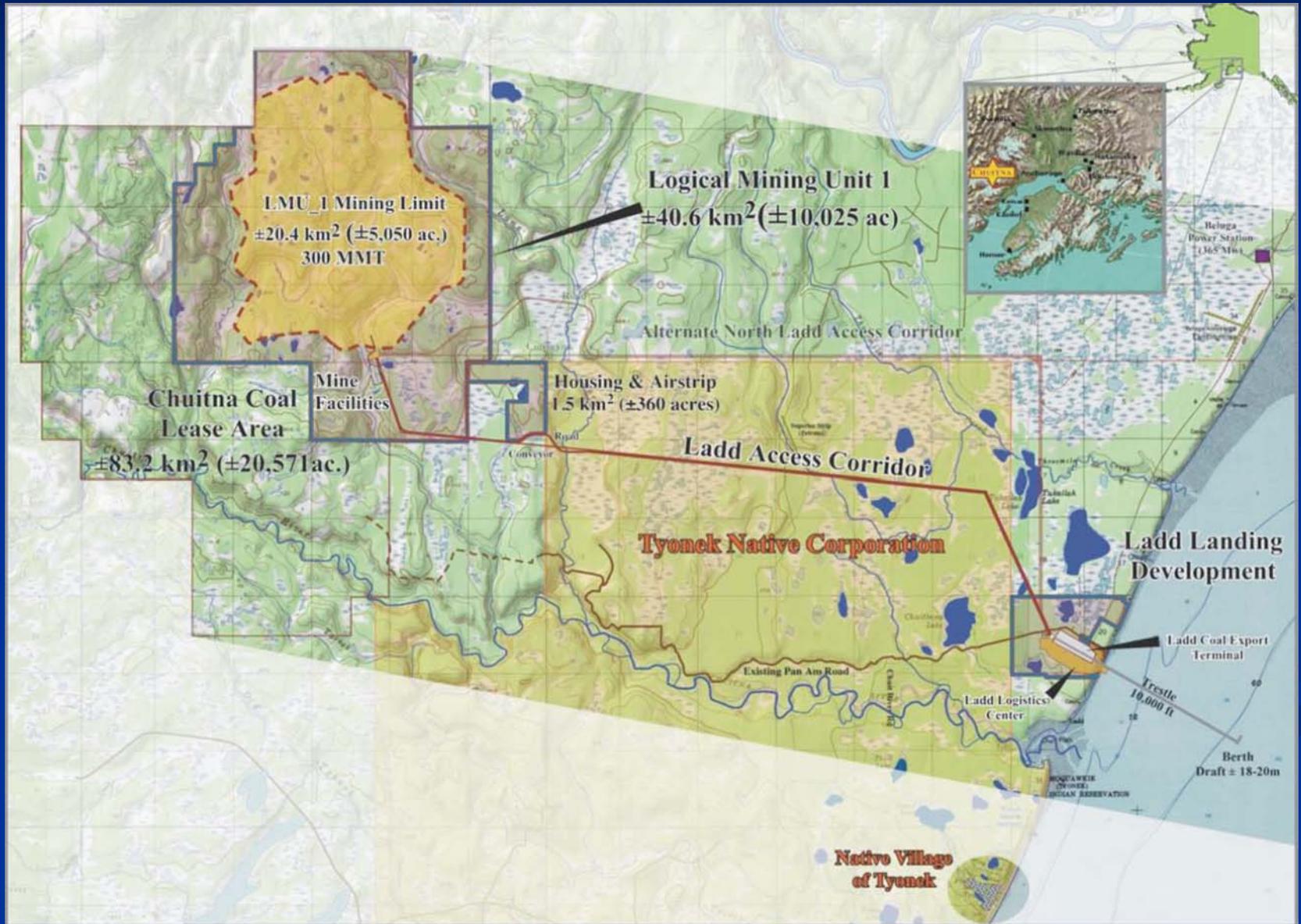
Chuitna Coal Project



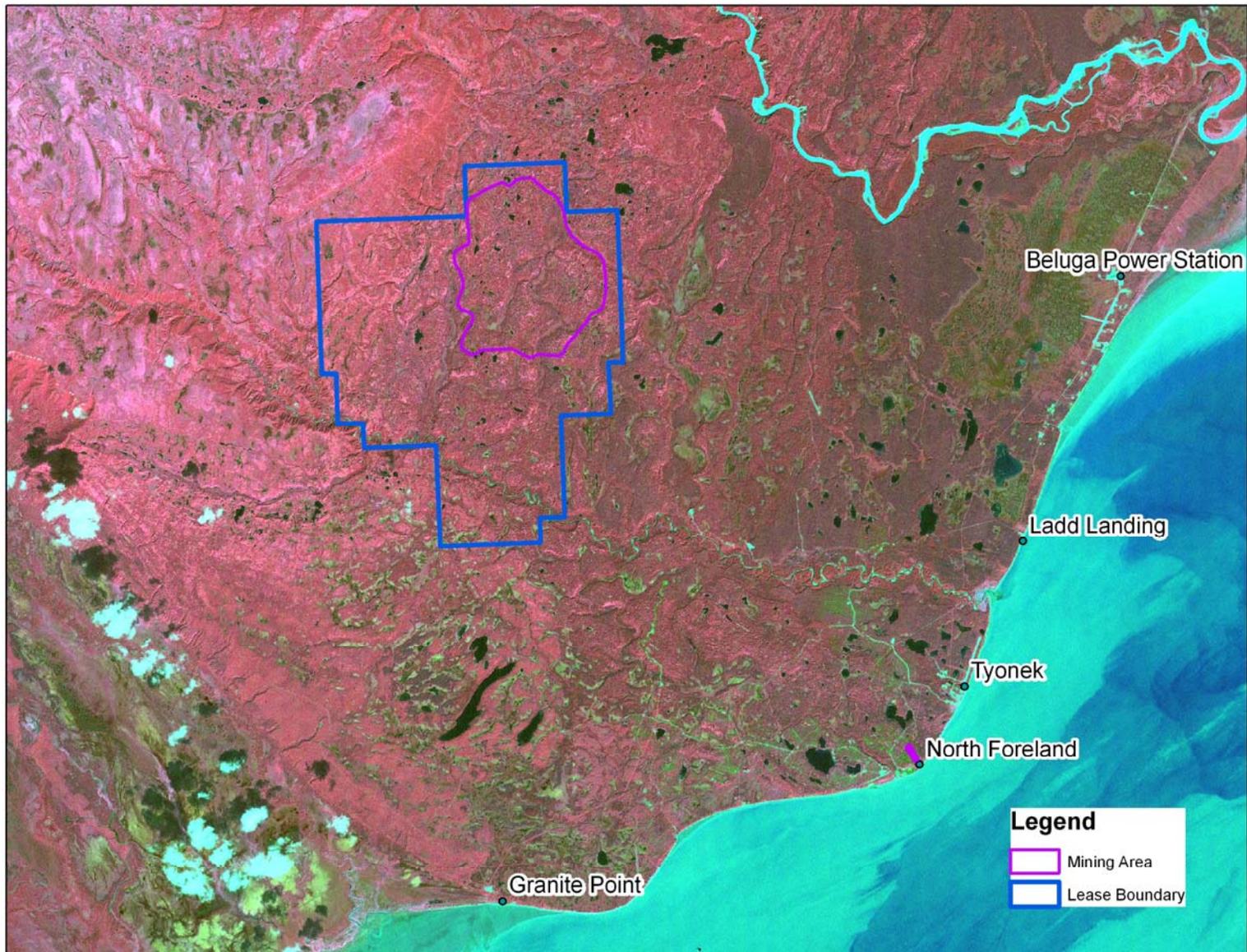
Anchorage

0 5 10 20 30 Miles

Chuitna Project Area



Chuitna Project Area (cont.)



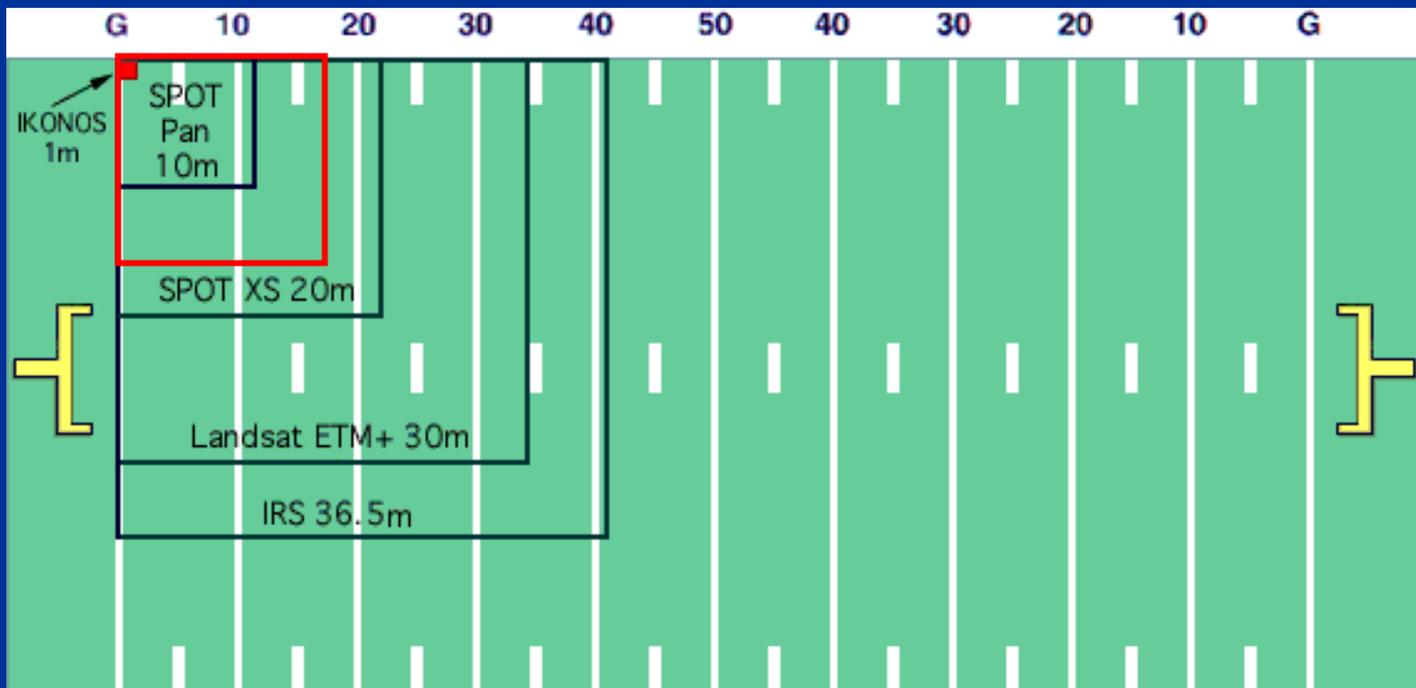
Landsat 7

Spatial Resolution

Landsat:

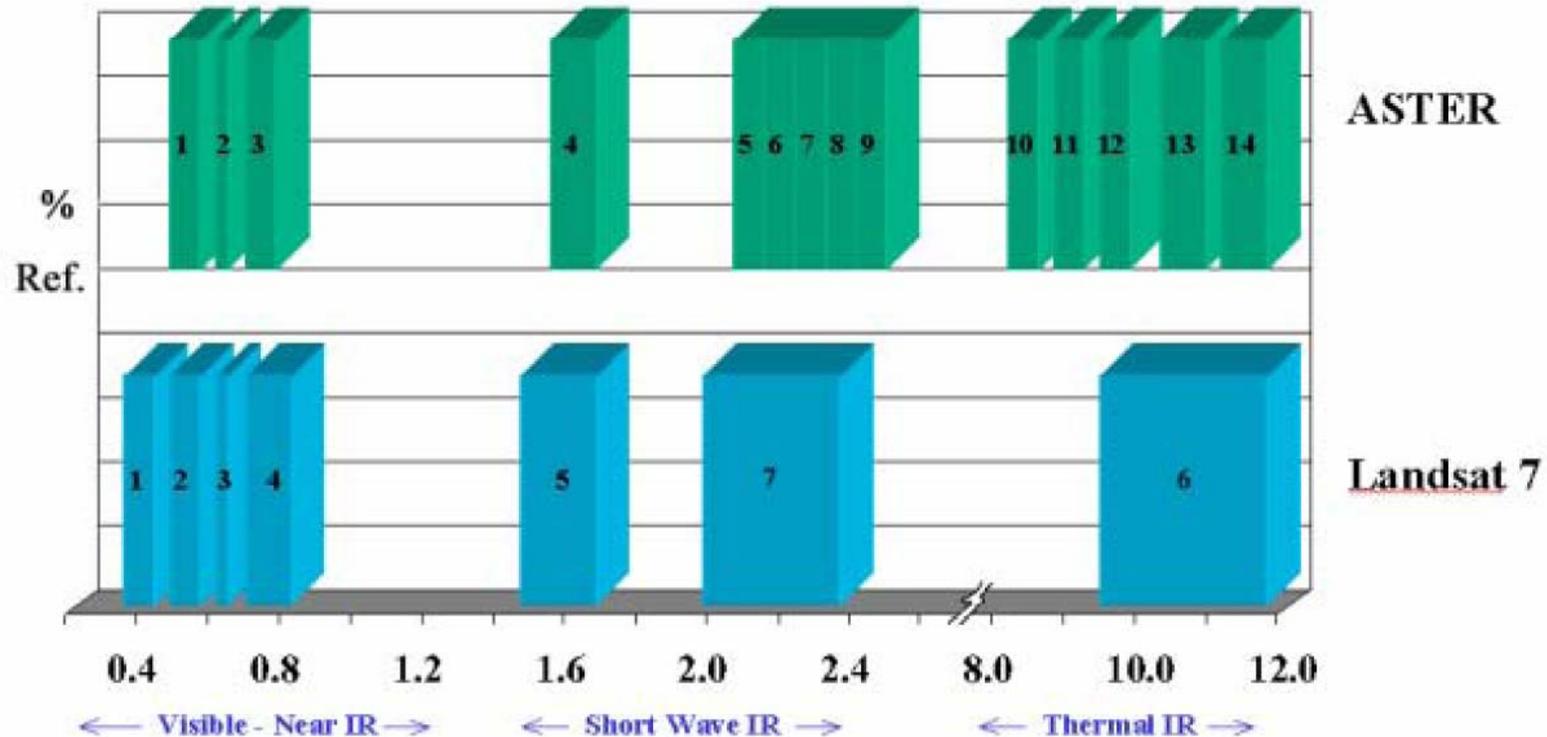
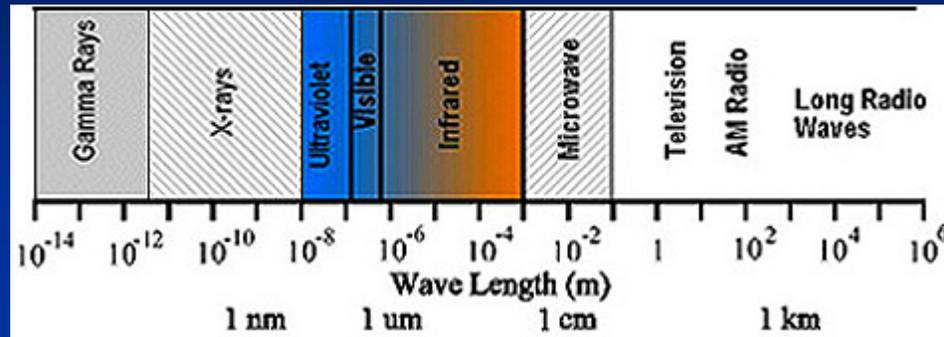
bands 1-7: 30 meters

panchromatic: 15 meters

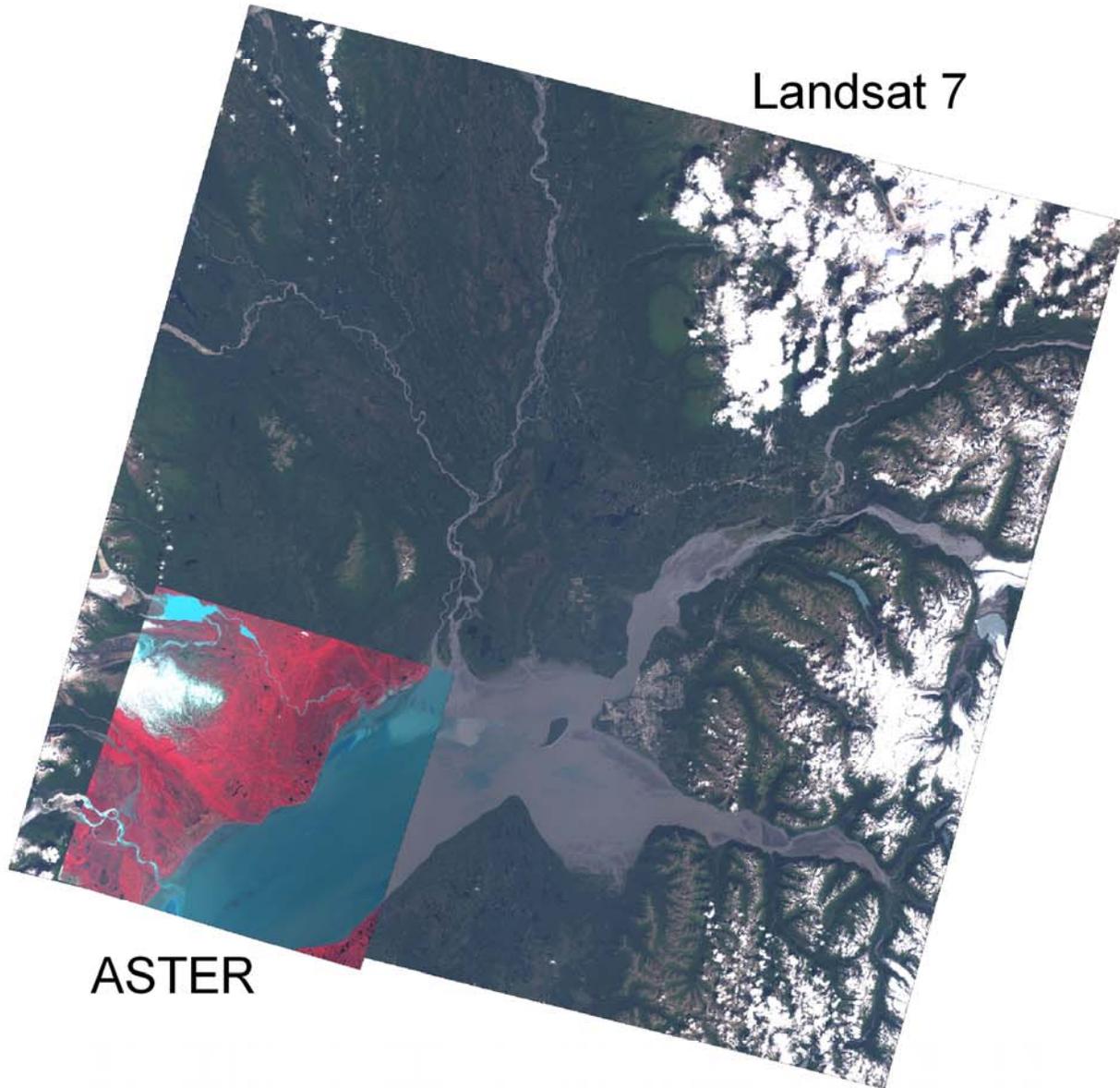


Landsat 7

Spectral Resolution



Landsat 7



ASTER

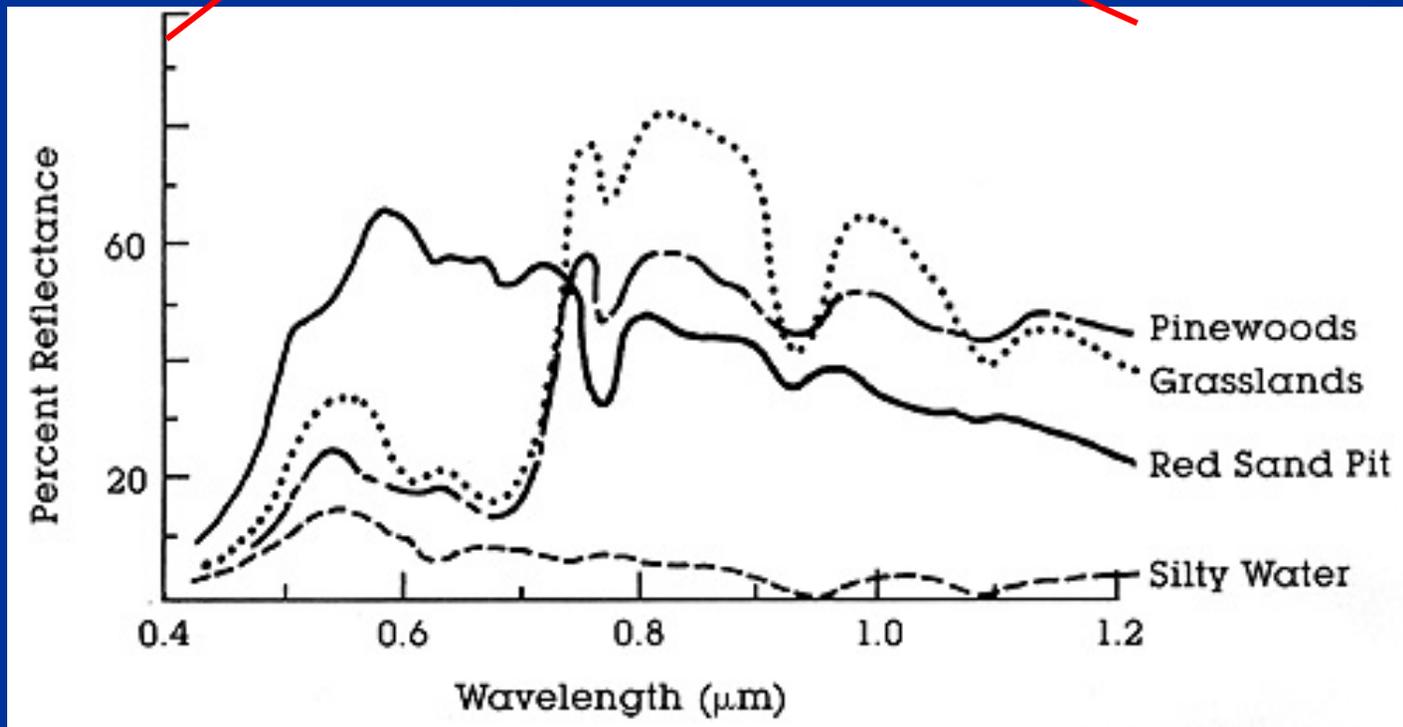
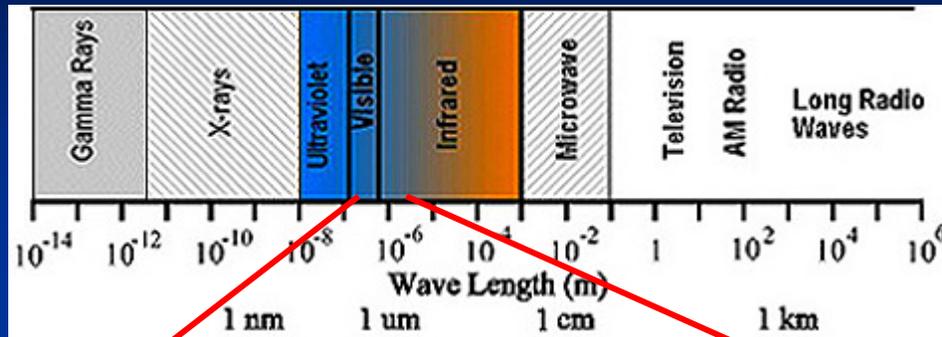
Image Classification

- Image classification is a means to convert spectral raster data into a finite set of categories (classifications) that represent the surface types seen in the imagery.
- These may be used to identify vegetation types, anthropogenic structures, mineral resources, or transient changes in any of these properties.

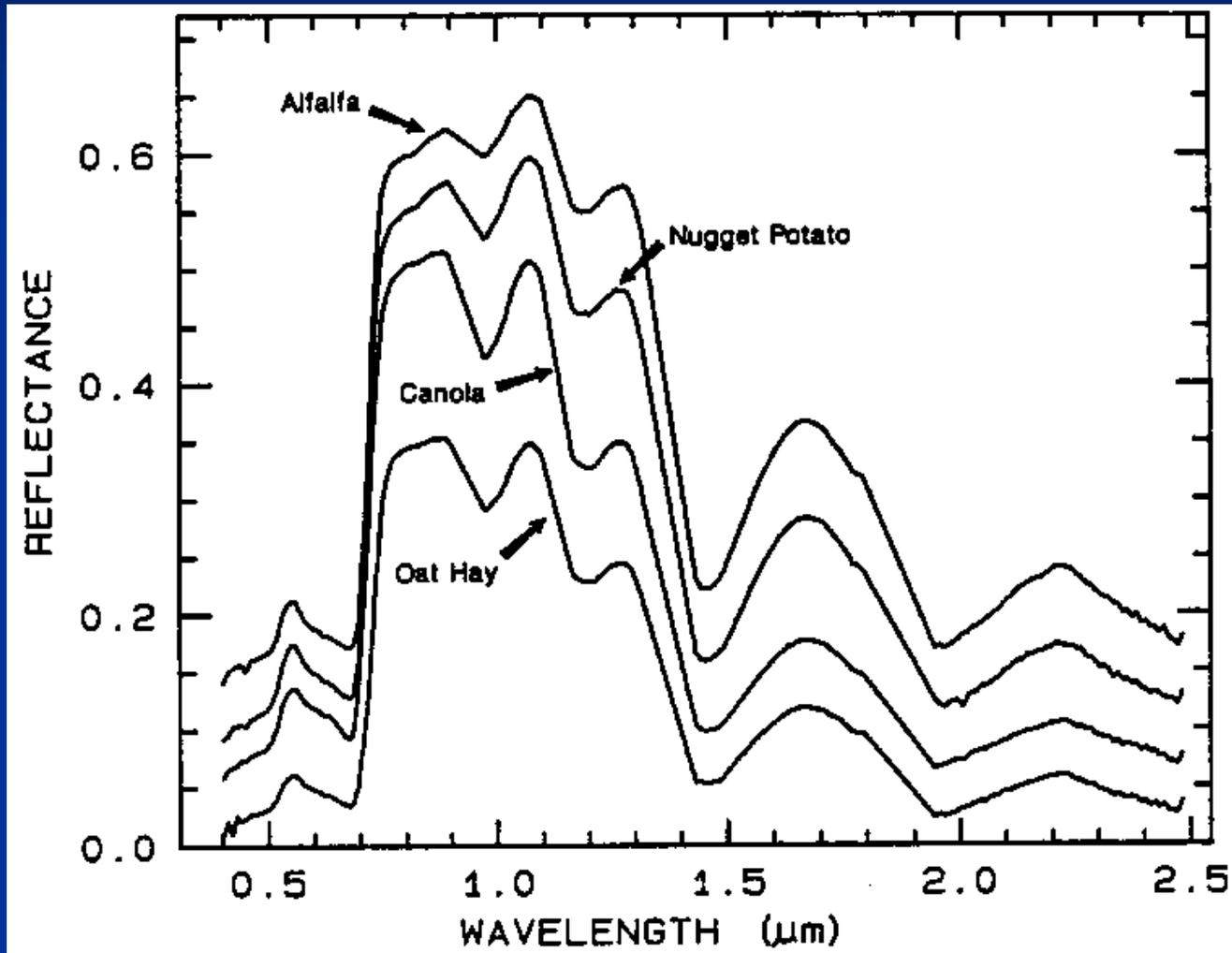
Image Classification (cont.)

- Groups pixels of like DN values across multiple bands into a category (classification)
- The output of an image classification is a thematic image.
- Supervised or Unsupervised classification

Spectral Signatures



Spectral Signatures (cont.)

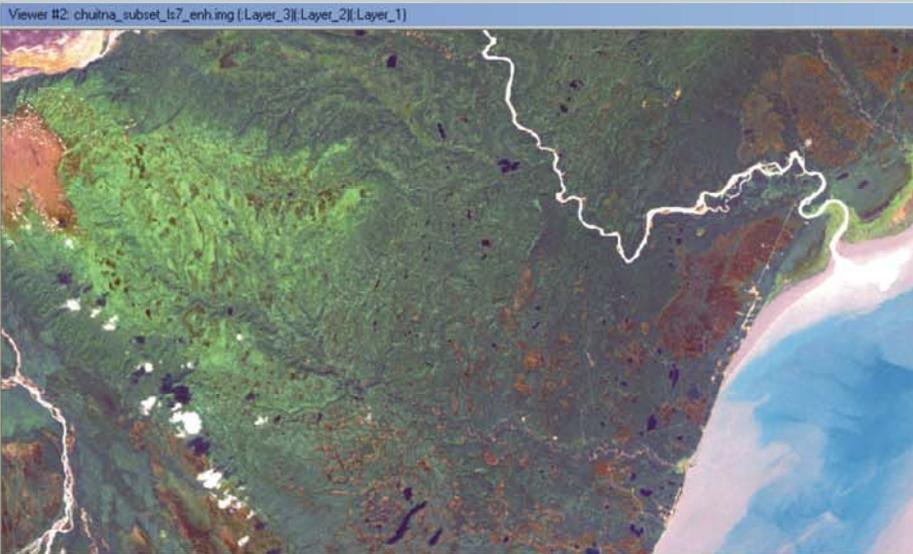


Band Comparison

1:250000

Display Enhance Zoom/Rotate Roam General Spectral

Spectral: Landsat 4 TM - 6 B R 5
TM False Natural C G 4
B 3

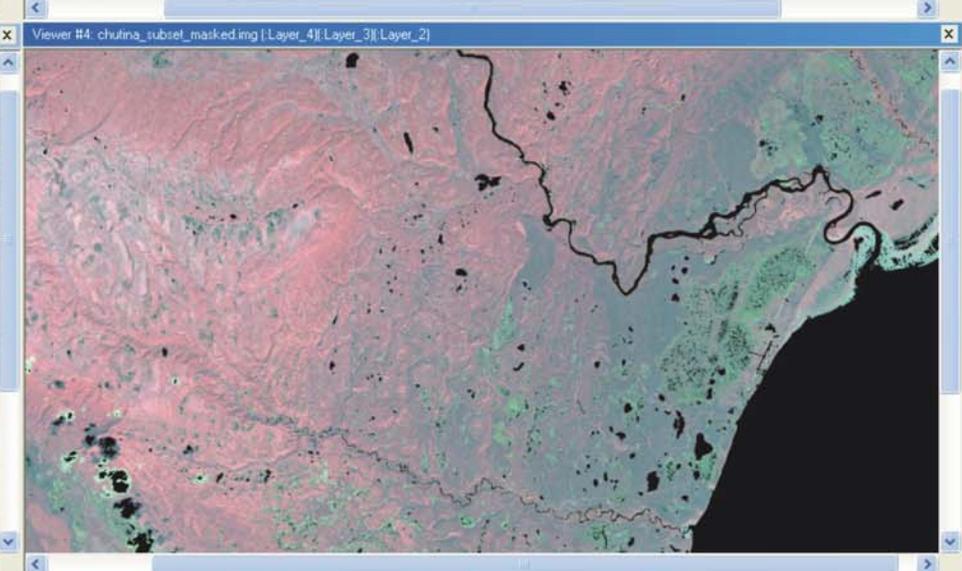
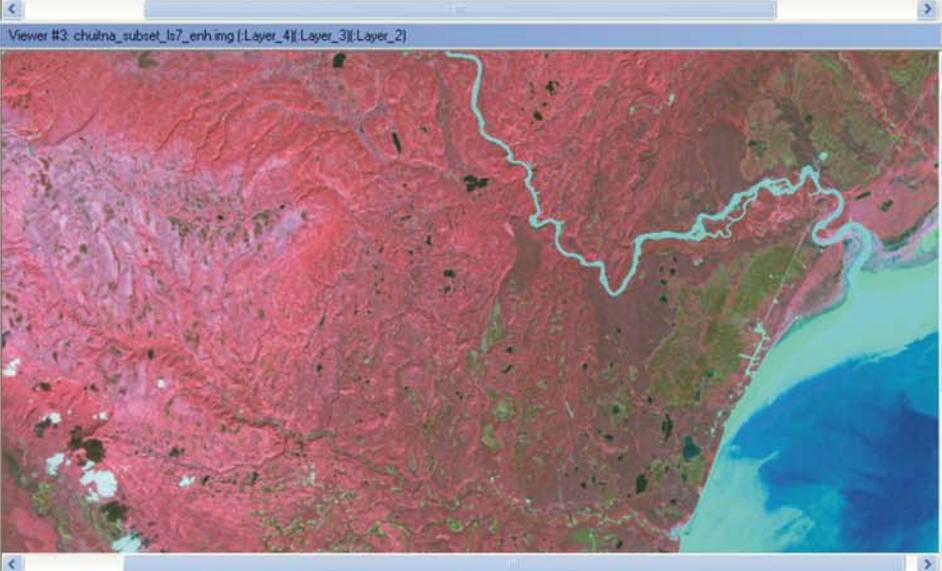
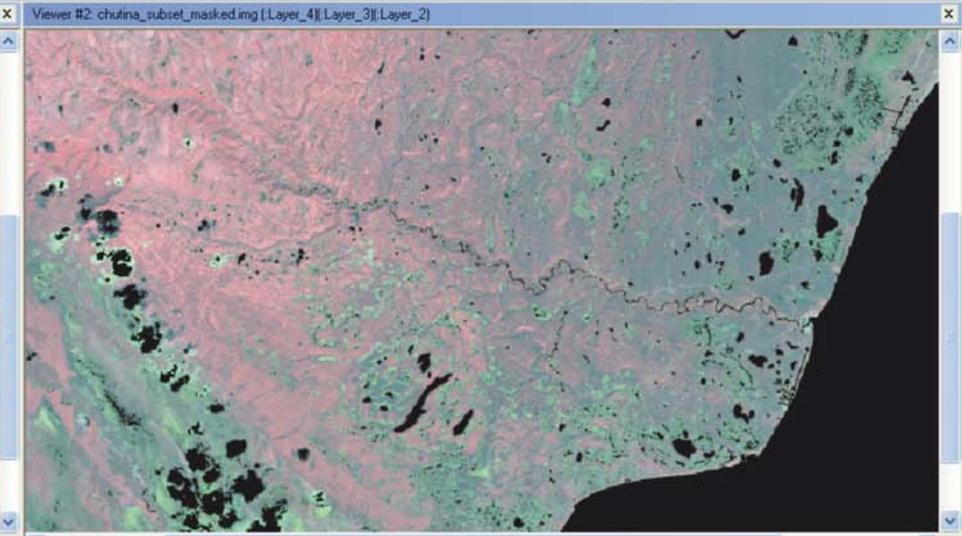


119875.00, 1239120.00 (Albers Conical Equal Area / WGS 84) 119875.00, 1239120.00 meters (Albers Conical Equal Area (WGS 84)) 0.00 (CW)

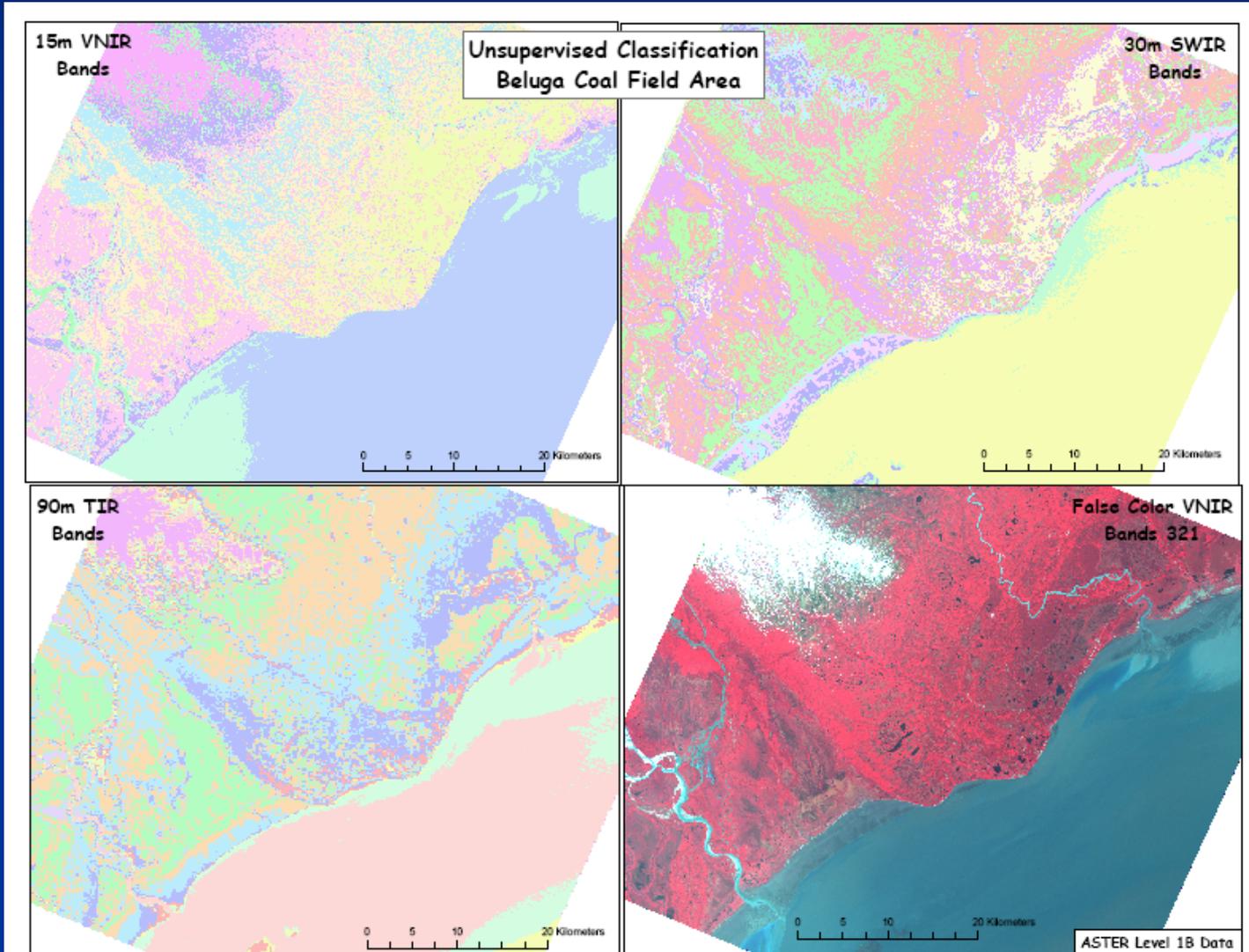
1:215767

Display Enhance Zoom/Rotate Roam General Spectral

Spectral: Landsat 4 TM - 6 B R 4, Custom G 3, B 2



Unsupervised Classification using ASTER Imagery



Training Areas



Signature Editor (chuitna_training.sig)

Class #	Signature Name	Color	Red	Green	Blue	Value
1	> Spruce		0.484	0.593	0.604	1
2	Aspen-Popular		0.590	0.596	0.616	2
3	Muskeg		0.547	0.700	0.618	3
4	Muskeg 2		0.478	0.629	0.594	4
5	Tundra		0.758	0.627	0.656	5
6	Marsh/Grass		0.644	0.656	0.660	6
7	Mudflats		0.563	0.803	0.753	7
8	muskeg 3		0.653	1.000	0.715	8
9	Aspen-Popular 2		0.732	0.633	0.648	9

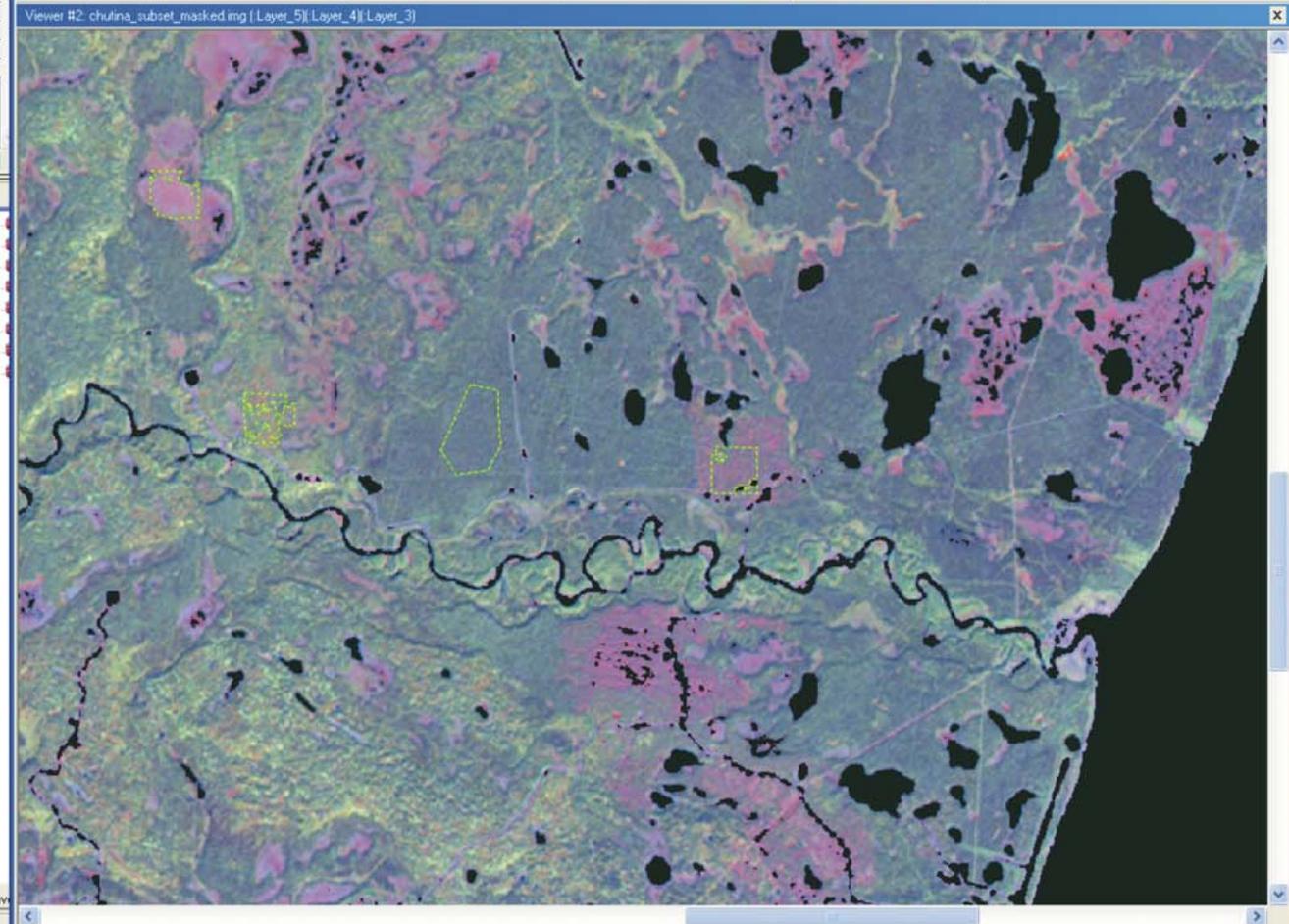
Untitled - GLT Viewer

File Utility View AOI Interpreter Raster Help

1:44037

Display Enhance Zoom/Rotate Room General Spectral

LandSat 7 Multispec R 5
TM False Natural C G 4
B 3



Proposed_use
quickbird_area
roads

- fds_deadfall
- fds_Healy_mine_features_nad83sp4
- fds_Healy_mine_features_nad83utm7
- fds_Inspections
- fpl_deadfall_contour
- fpl_healy_contour_nad83_1
- secsc63_bel
- tbl_MLWemployee_public
- tblAcres
- tblBlasters
- tblBondFiles
- tblContact
- tblDecisionPDF
- tblGIS
- tblHistoryCode
- tblInspection
- tblInspectPDF
- tblInspectType
- tblLatLong
- tblLease
- tblLegal
- tblLiability
- tblMeridian
- tblMineInformation
- tblMTRS
- tblNOV
- tblOperator
- tblOtherPermits
- tblPermitFiles
- tblPermitHistory

AOI

Close ?

Vegetation Types (Grass)



Training Areas



Signature Editor (chuitna_training.sig)

Class #	Signature Name	Color	Red	Green	Blue	Value
1	> Spruce		0.484	0.593	0.604	1
2	Aspen-Popular		0.590	0.596	0.616	2
3	Muskeg		0.547	0.700	0.618	3
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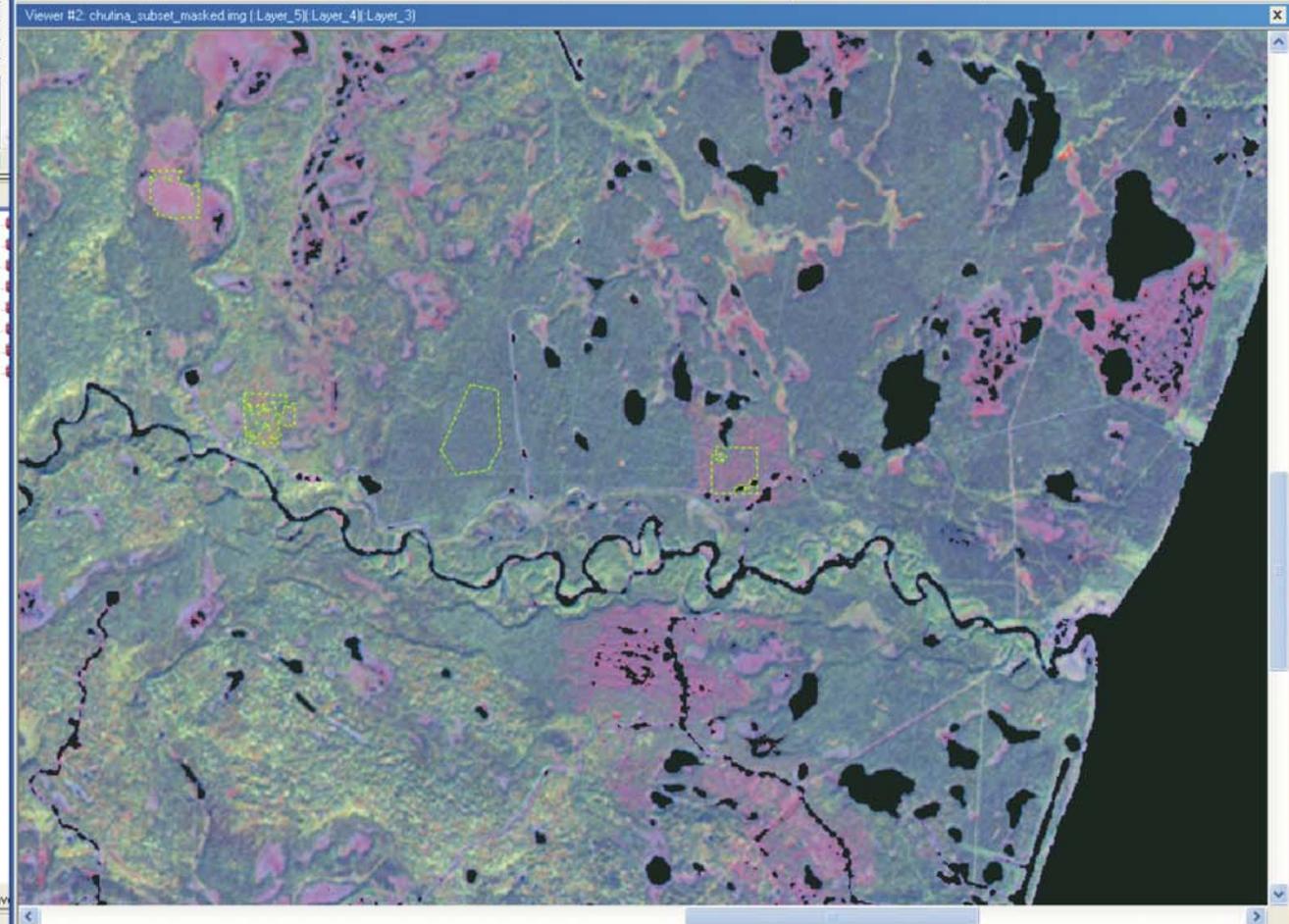
Untitled - GLT Viewer

File Utility View AOI Interpreter Raster Help

1:44037

Display Enhance Zoom/Rotate Room General Spectral

Spectral: Landsat 7 Multispec R 5, TM False Natural C G 4, B 3



Proposed_use
quickbird_area
roads
fds_deadfall
fds_Healy_mine_features_nad83sp4
fds_Healy_mine_features_nad83utm7
fds_Inspections
fpl_deadfall_contour
fpl_healy_contour_nad83_1
secsc63_bel
tbl_MLWemployee_public
tblAcres
tblBlasters
tblBondFiles
tblContact
tblDecisionPDF
tblGIS
tblHistoryCode
tblInspection
tblInspectPDF
tblInspectType
tblLatLong
tblLease
tblLegal
tblLiability
tblMerdian
tblMineInformation
tblMTRS
tblNOV
tblOperator
tblOtherPermits
tblPermitFiles
tblPermitHistory

AOI

Close ?

Vegetation Types (Tundra)



Vegetation Types (Aspen, Birch, Mixed forest)



Training Areas



Signature Editor (chuitna_training.sig)

Class #	Signature Name	Color	Red	Green	Blue	Value
1	> Spruce		0.484	0.593	0.604	1
2	Aspen-Popular		0.590	0.596	0.616	2
3	Muskeg		0.547	0.700	0.618	3
4	Muskeg 2		0.478	0.629	0.594	4
5	Tundra		0.758	0.627	0.656	5
6	Marsh/Grass		0.644	0.656	0.660	6
7	Mudflats		0.563	0.803	0.753	7
8	muskeg 3		0.653	1.000	0.715	8
9	Aspen-Popular 2		0.732	0.633	0.648	9

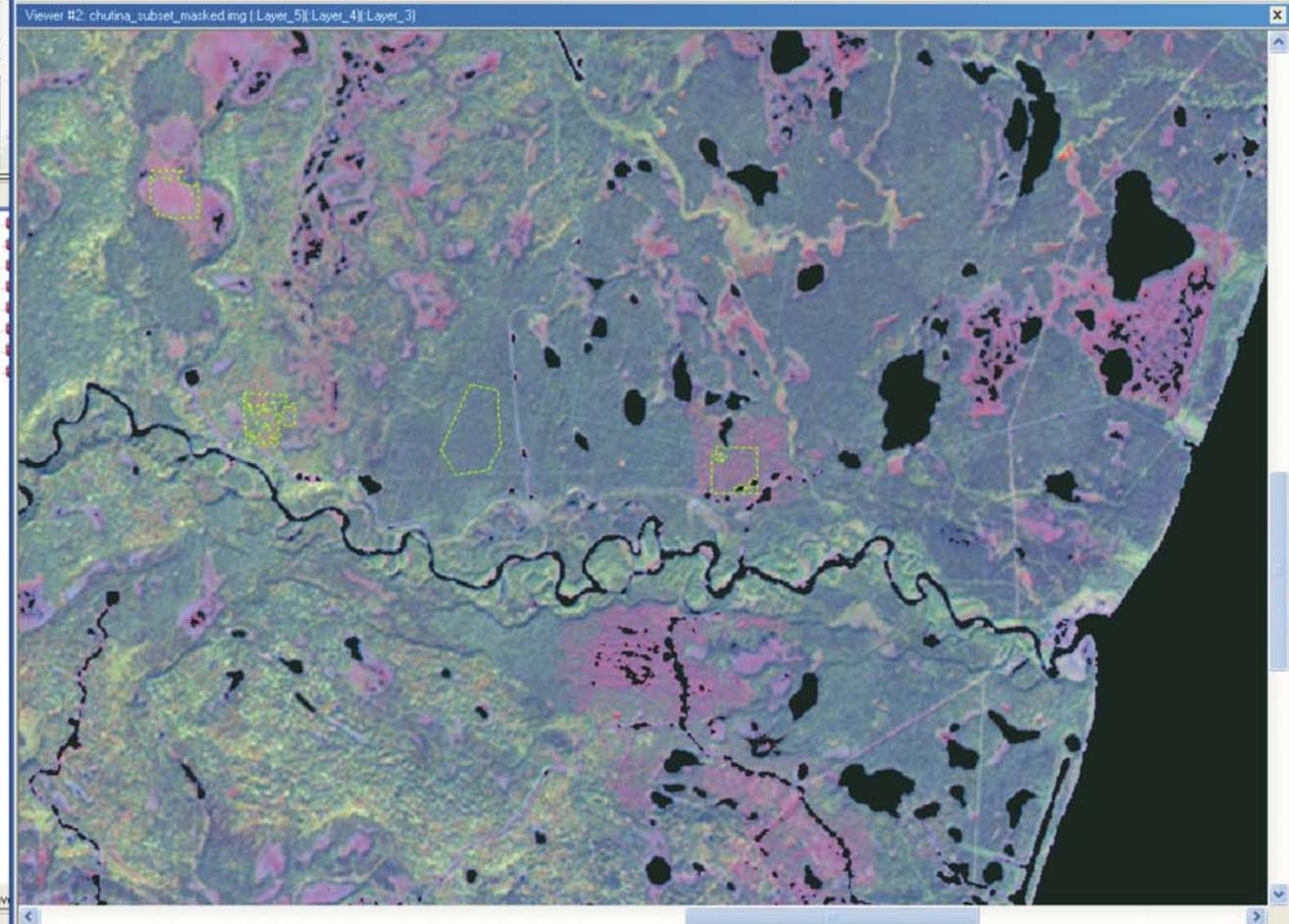
Untitled - GLT Viewer

File Utility View AOI Interpreter Raster Help

1:44037

Display Enhance Zoom/Rotate Room General Spectral

Spectral: Landsat 7 Multispec R 5, TM False Natural C G 4, B 3



Proposed_use
quickbird_area
roads
fds_deadfall
fds_Healy_mine_features_nad83sp4
fds_Healy_mine_features_nad83utm7
fds_Inspections
fpl_deadfall_contour
fpl_healy_contour_nad83_1
secsc63_bel
tbl_MLWemployee_public
tblAcres
tblBlasters
tblBondFiles
tblContact
tblDecisionPDF
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tblHistoryCode
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tblInspectPDF
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tblLegal
tblLiability
tblMerdian
tblMineInformation
tblMTRS
tblNOV
tblOperator
tblOtherPermits
tblPermitFiles
tblPermitHistory

AOI

Close ?



Band Plot

Pack 2



Signature Editor (chuitna_training.sig)

File Edit View Evaluate Feature Classify Help

Class #	Signature Name	Color	Red	Green	Blue	Value	Order	Count	Prob.	P	I	H	A	FS
>	Spruce		0.484	0.593	0.604	1	1	1915	1.000	X	X	X	X	X
	Aspen-Popular		0.590	0.596	0.616	2	2	1000	1.000	X	X	X	X	X
	Muskeg		0.547	0.700	0.618	3	3	1000	1.000	X	X	X	X	X
	Muskeg 2		0.478	0.629	0.594	4	4	1000	1.000	X	X	X	X	X
	Tundra		0.758	0.627	0.656	5	5	1000	1.000	X	X	X	X	X
	Marsh/Grass		0.644	0.656	0.660	6	6	1000	1.000	X	X	X	X	X
	Mudflats		0.563	0.803	0.753	7	7	1000	1.000	X	X	X	X	X
	muskeg 3		0.653	1.000	0.715	8	8	1335	1.000	X	X	X	X	X
	Aspen-Popular 2		0.732	0.633	0.648	9	9	16817	1.000	X	X	X	X	X

GLT Viewer

AGI Interpreter Raster Help

1:180706

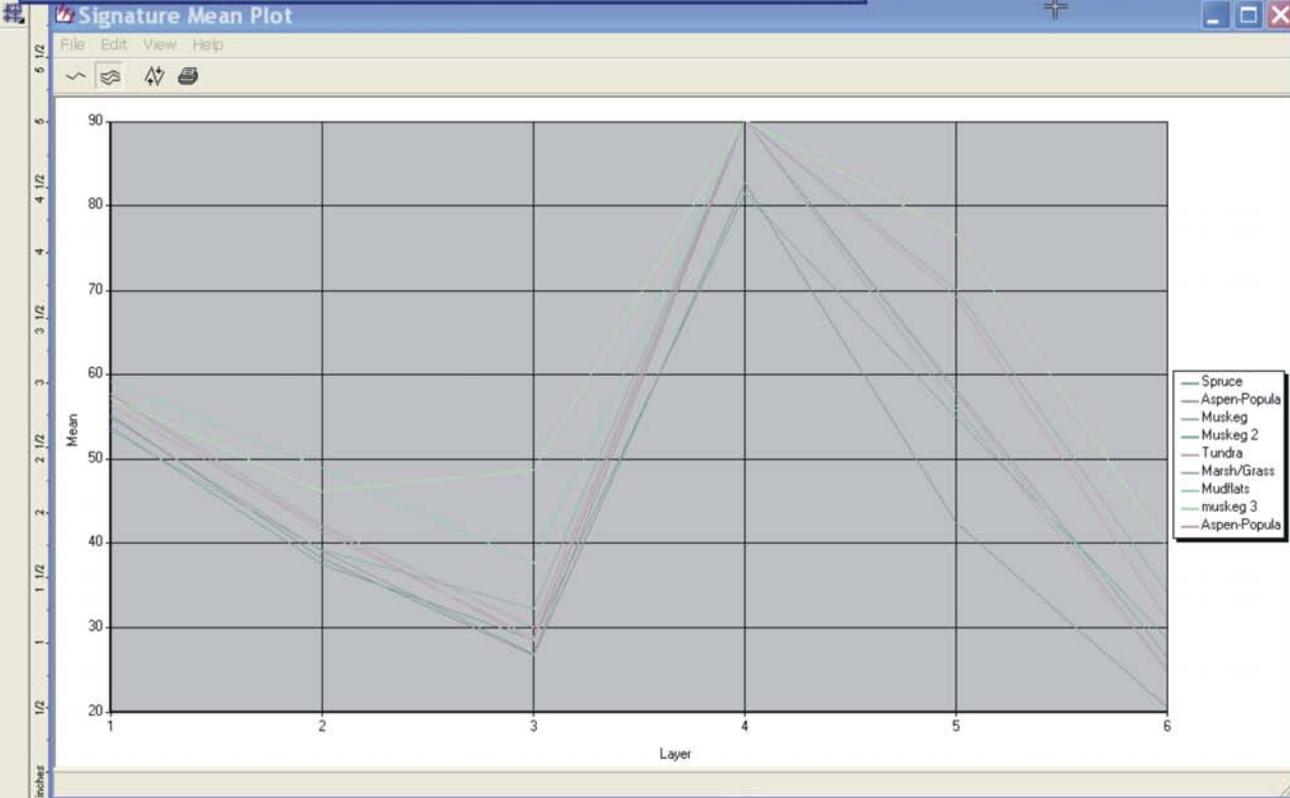
Enhance: [Color Balance] [Stretch] [Gamma] [Histogram]

Zoom/Rotate: [Zoom In] [Zoom Out] [Zoom Reset] [Rotate] [Rotate 90]

Roam: [Pan] [Zoom] [Home]

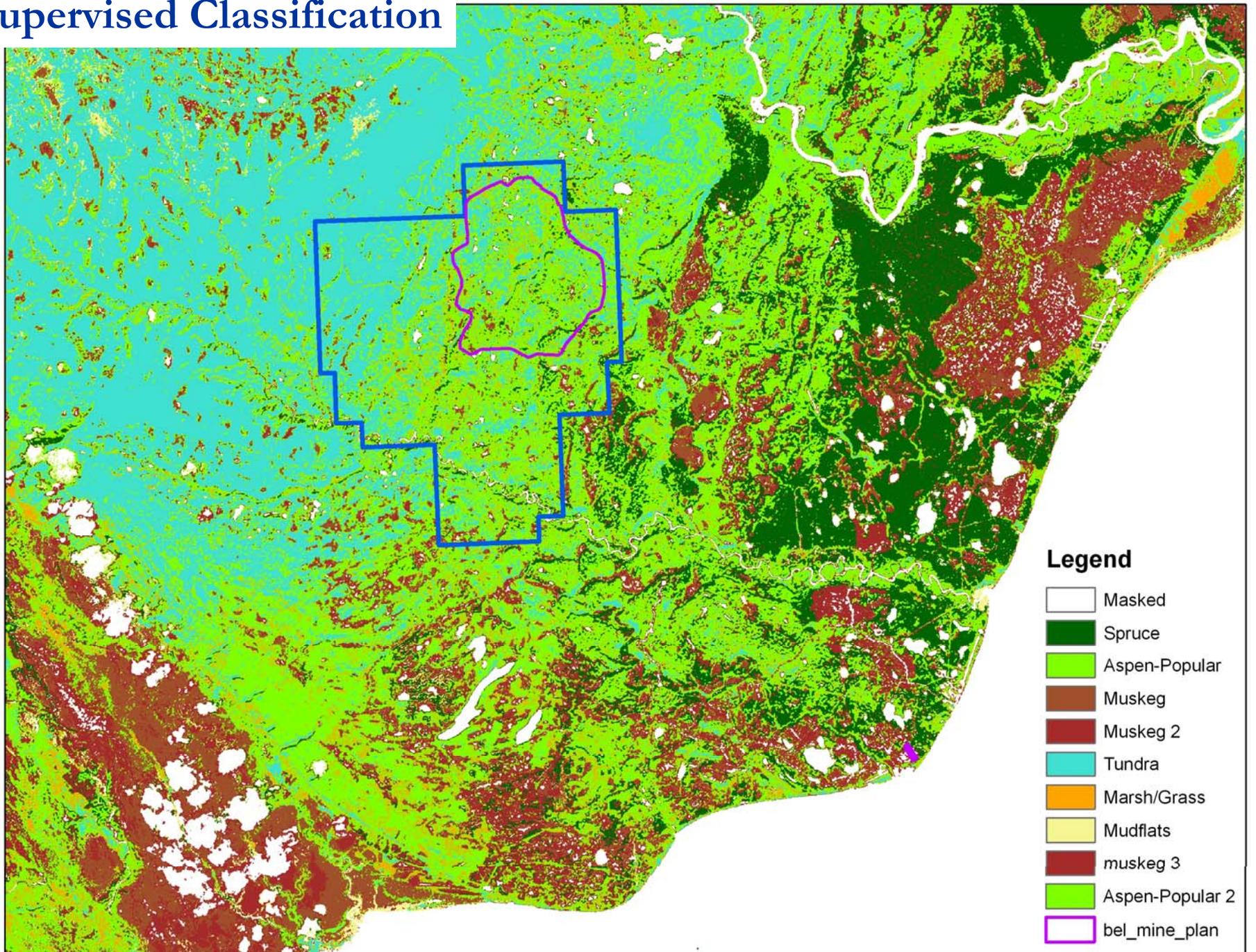
General: [Layers] [Legend] [Scale] [Info]

Spectral: Landsat 7 Multispec, TM Desert Detail 1



139557.83, 1240769.28 (Albers Conical Equal Area / WGS 84) 139557.83, 1240769.28 meters (Albers Conical Equal Area (WGS 84)) 0.00 (CW)

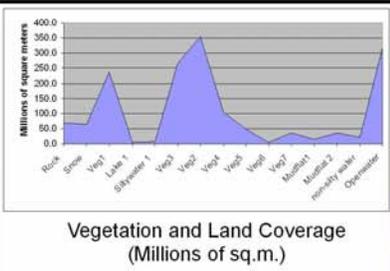
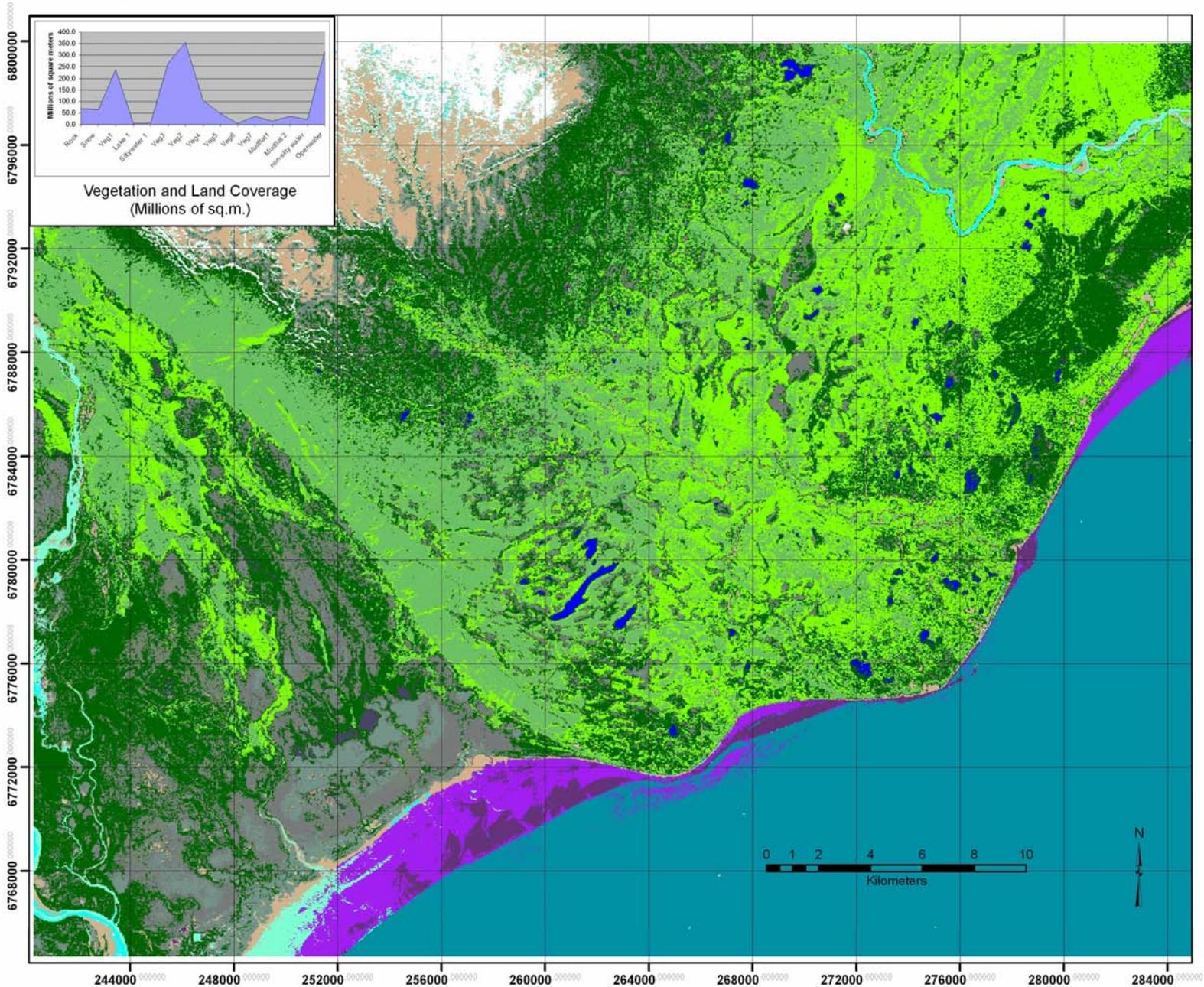
Supervised Classification

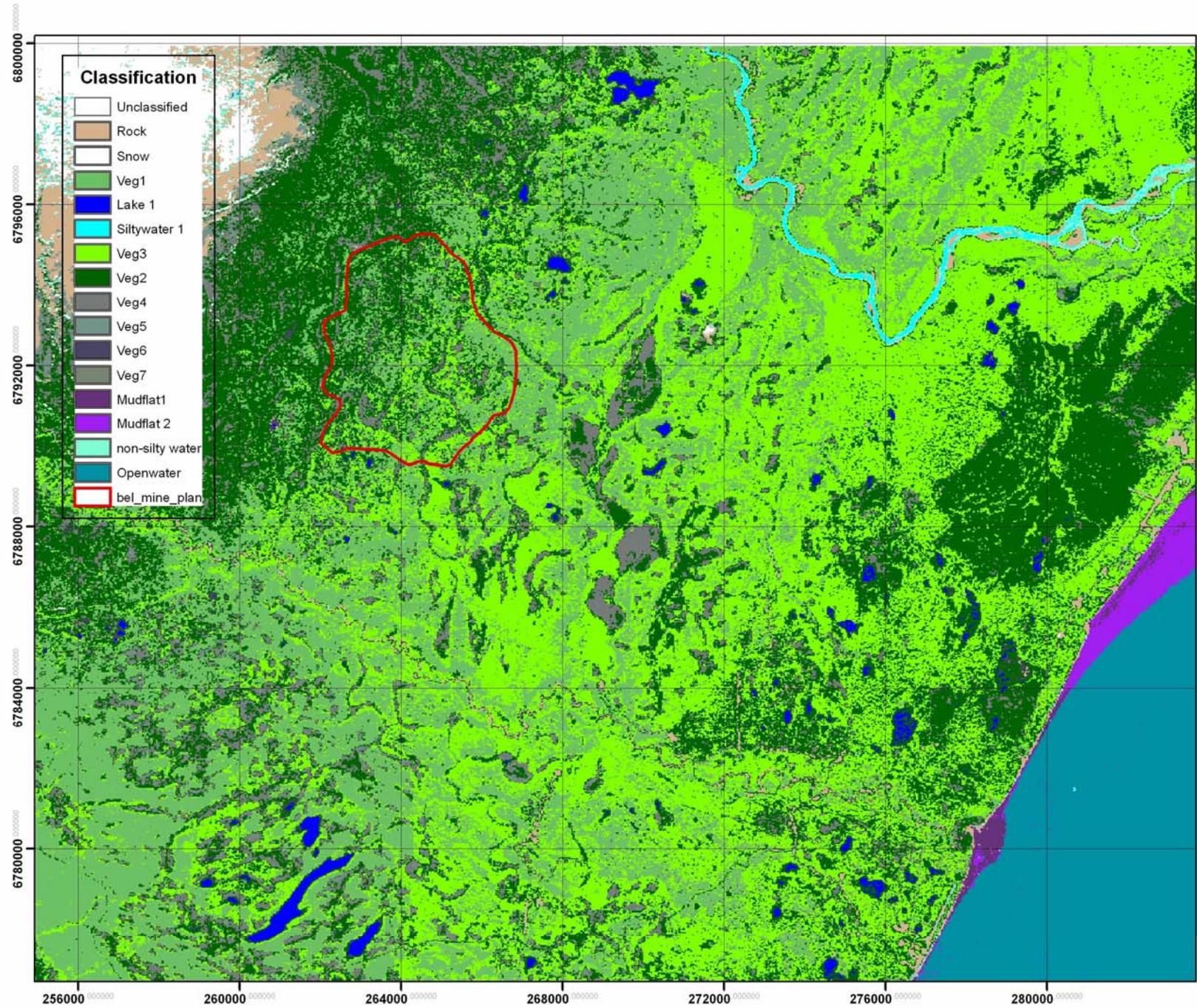


Other Examples

Supervised Classification (Beluga Area)

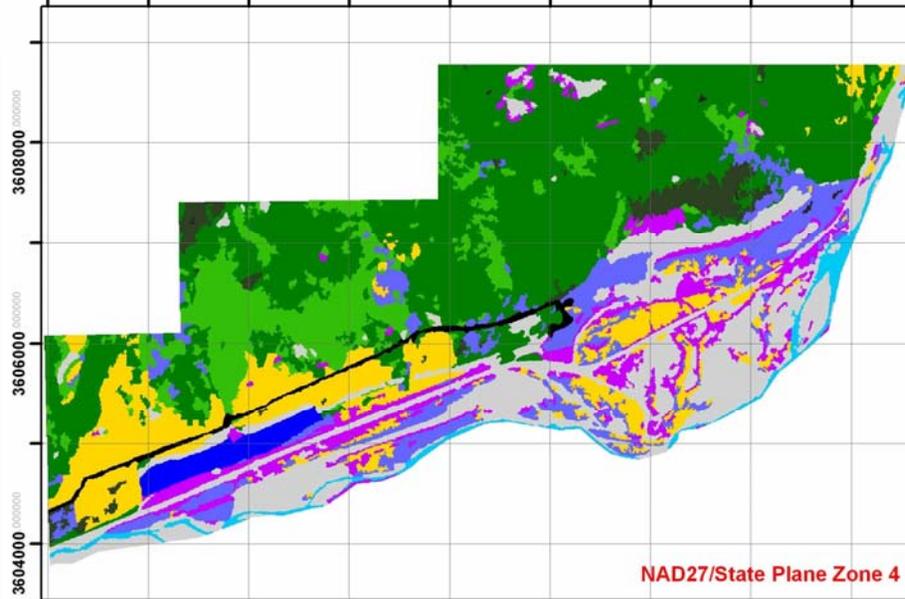
ASTER Level 1B data VNIR and SWIR sensors





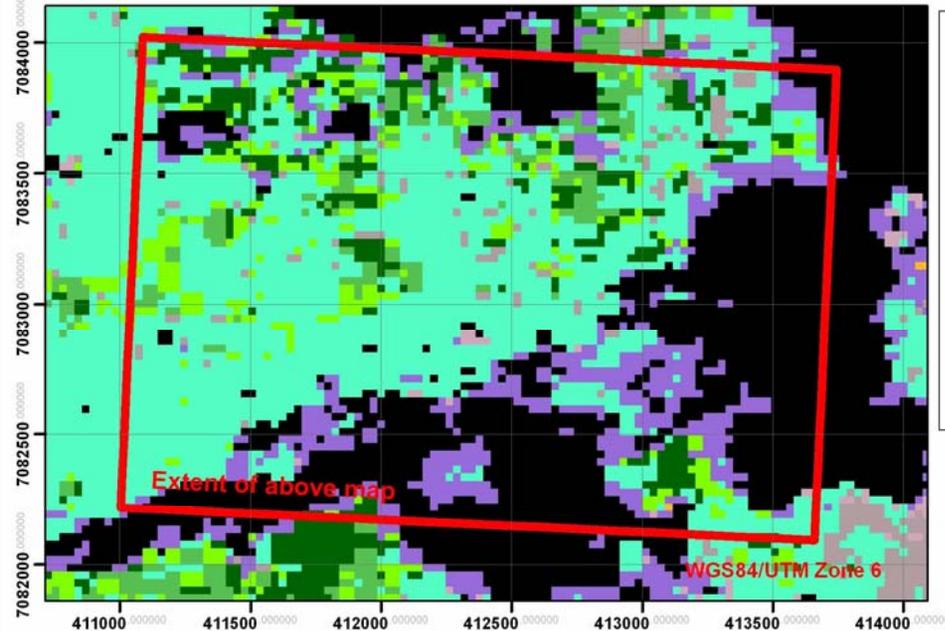
Rosalie Mine

692000 693000 694000 695000 696000 697000 698000 699000 700000



Legend

- Closed Alder
- Closed Birch
- Closed Poplar
- Open White Spruce - Paper Birch
- Open White Spruce
- Terra Debilis
- Disturbed Vegetation
- Lake
- Creek



Legend

- Unclassified
- muskeg
- open spruce
- spruce
- birch/alder
- mixed
- rock1
- rock 2
- alpine tundra
- disturbed

Other Uses of aerial photos and satellite images

- Change Detection
- Vegetative Health
- Feature Mapping
- Volcano/Forest Fire Detection



Thank you