Monitoring Forest and Rangeland Change Using Landsat Continuity and Alternative Sources of Satellite Data

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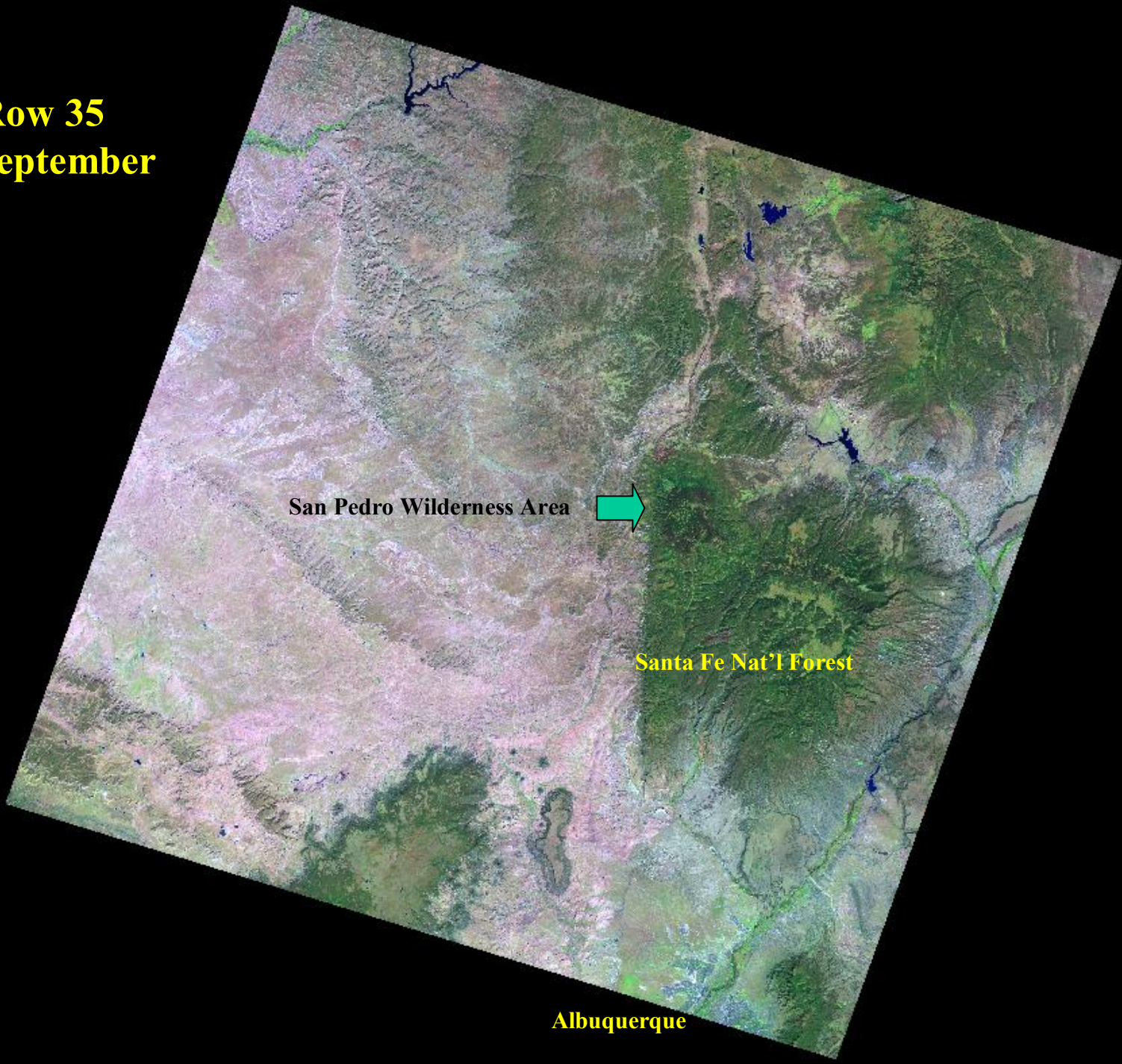
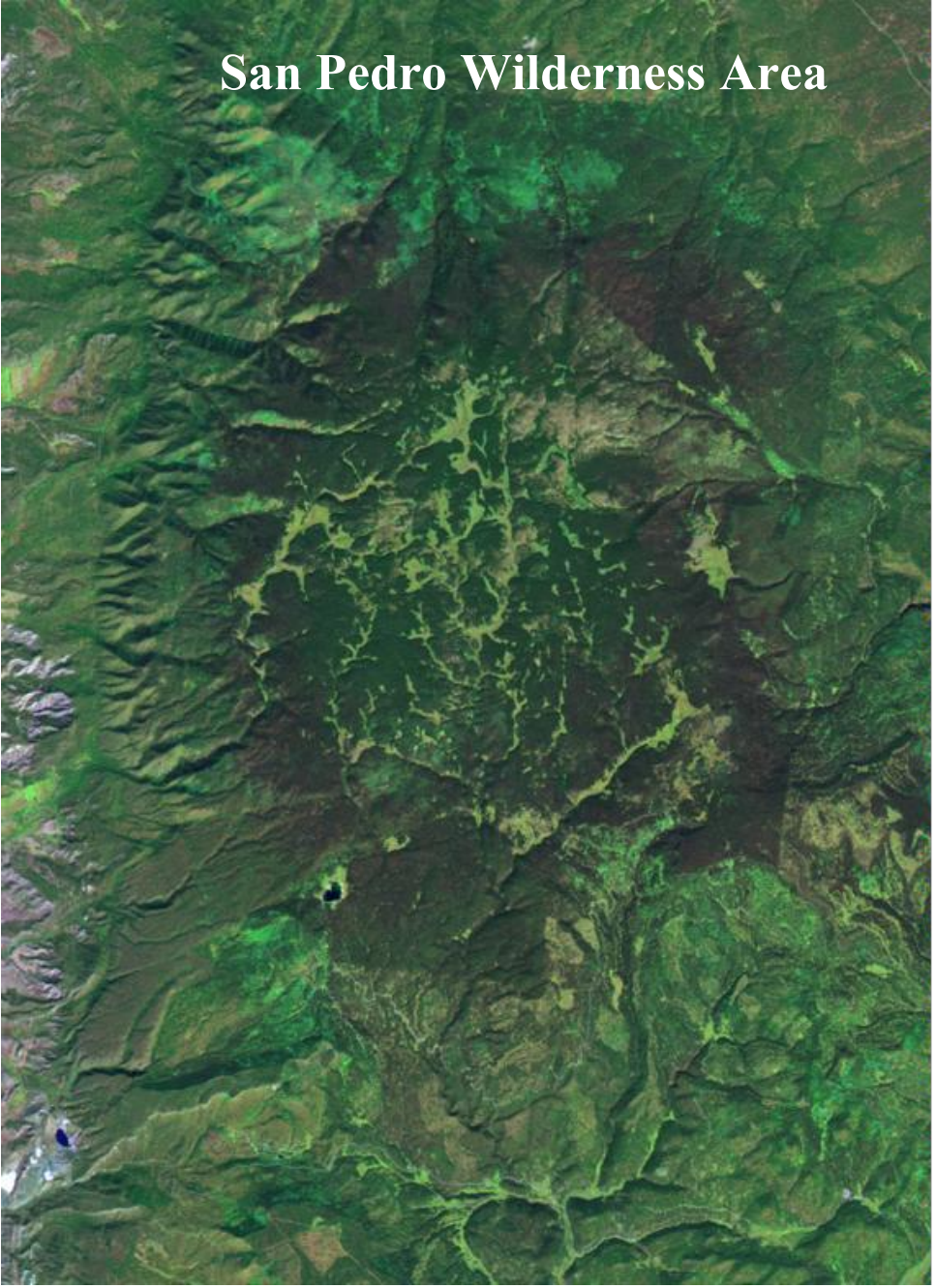
Current tasks

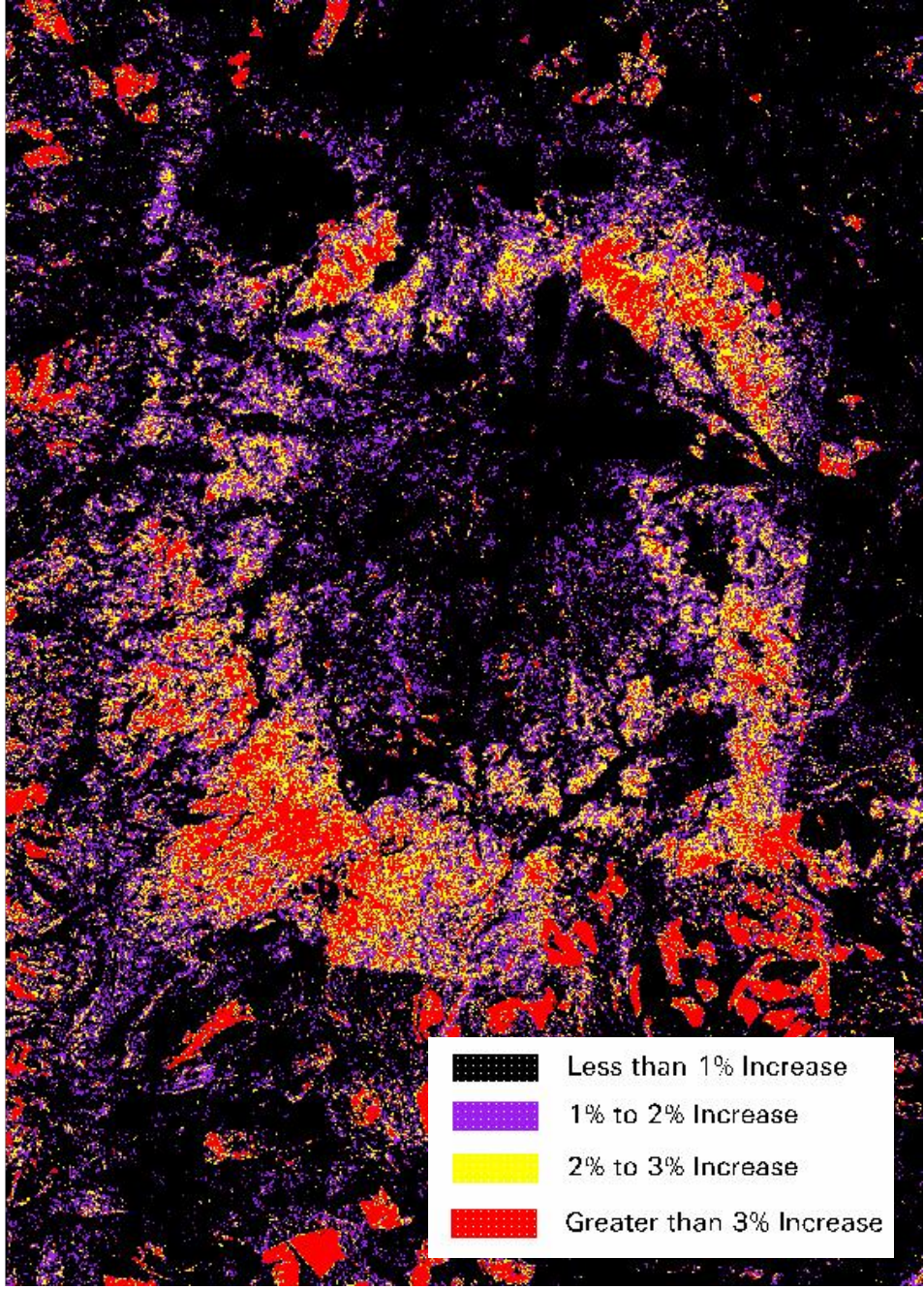
- Assessing at-sensor reflectance data as a function of seasonality
- Assessing comparability of Landsat and AWiFS data
- Assessing landscape-level trends between 1988 and 2006 using Landsat reflectance data
- Two study areas
  - Gombe National Park region w/Jane Goodall Institute (currently in data acquisition mode)
  - Four-Corners region in southwestern US (data analysis mode)

WRS Path 34 Row 35
Landsat TM; September 30, 2006





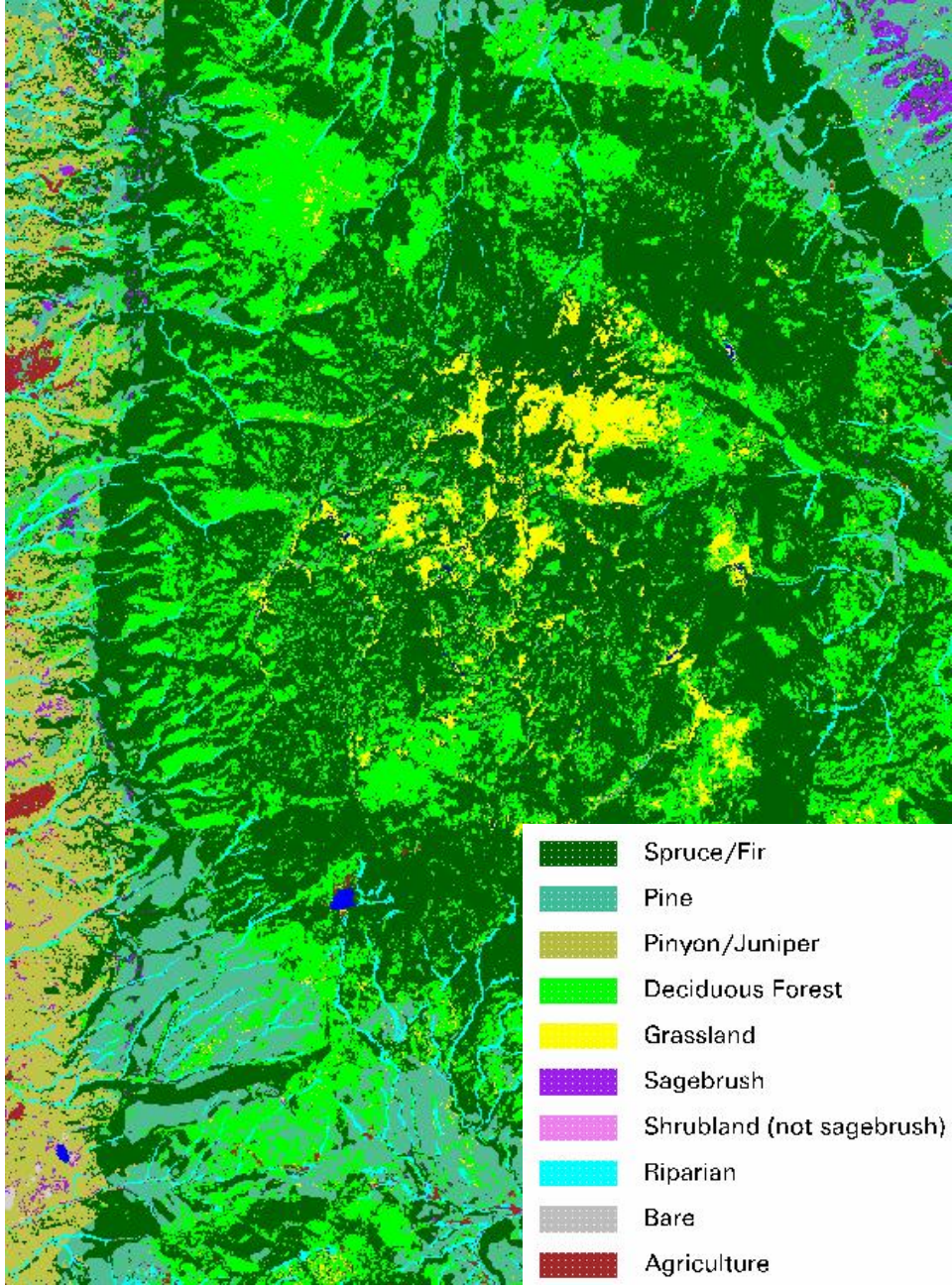
September 30, 2006 TM Image (New Mexico)



Band 5 Increases between 1988 and 2006

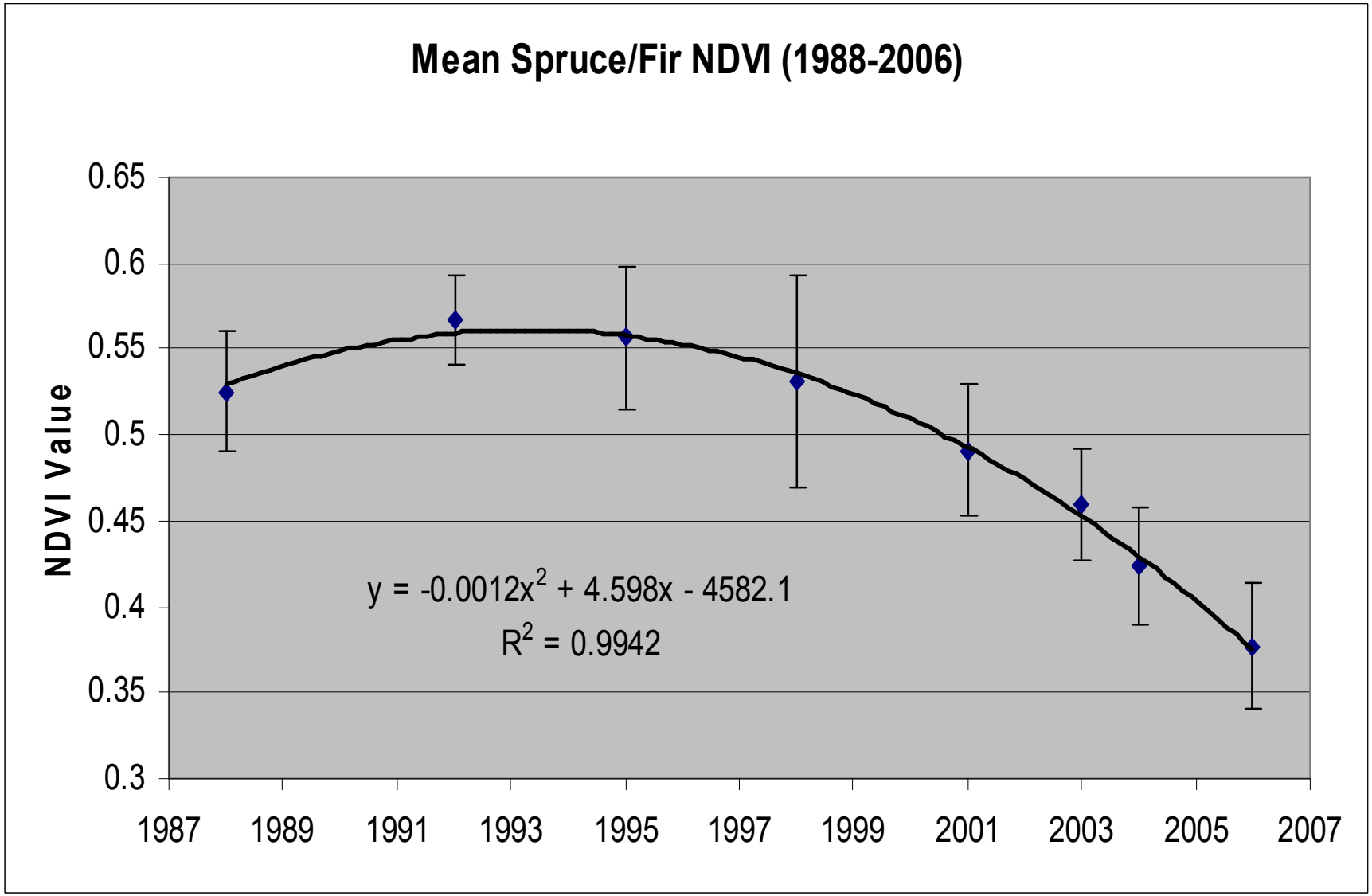
Landsat Scenes Used

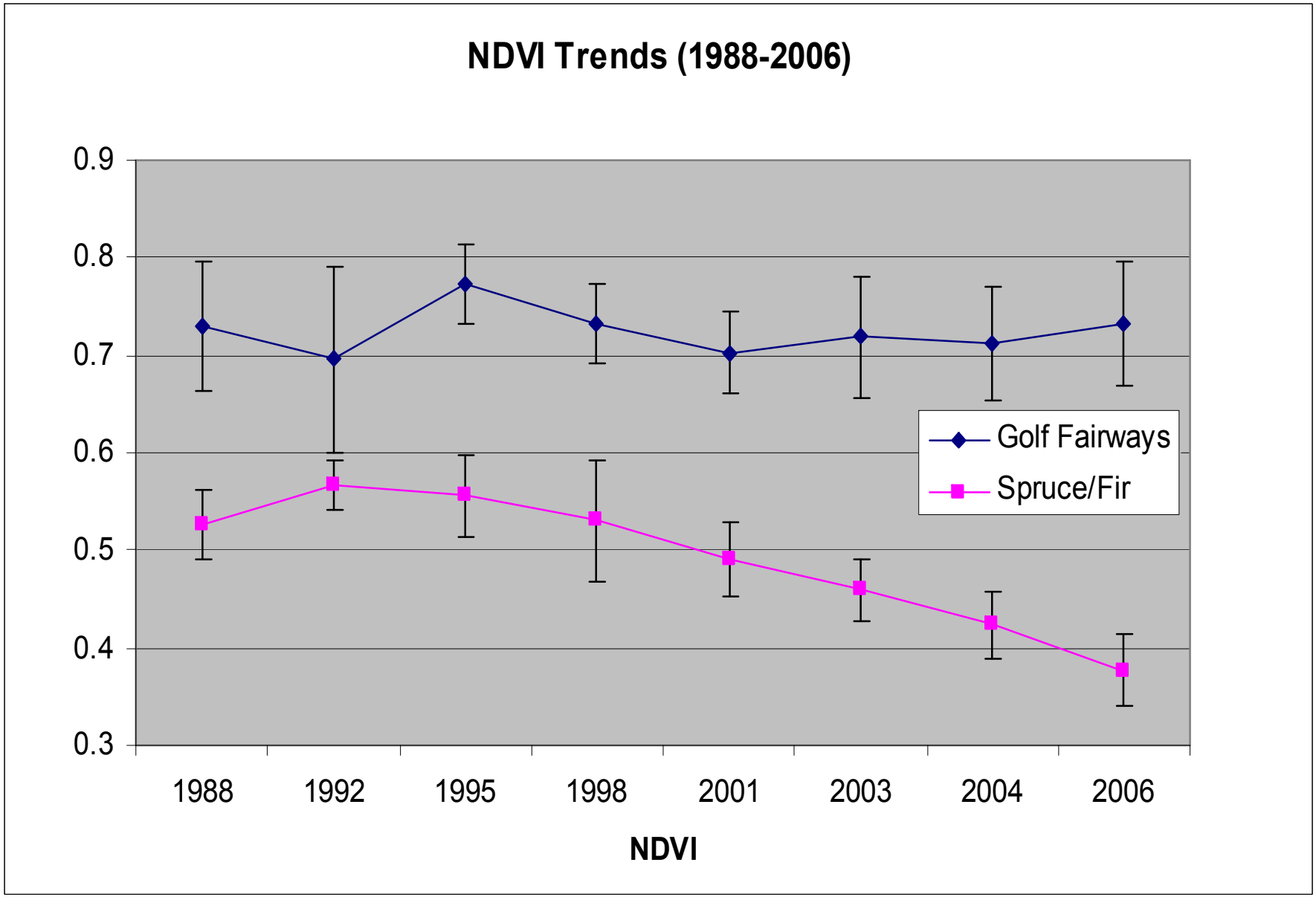
- September 28, 1988
- September 7, 1992
- October 9, 1995
- September 24, 1998
- September 24, 2001
- September 22, 2003
- September 24, 2004
- September 30, 2006

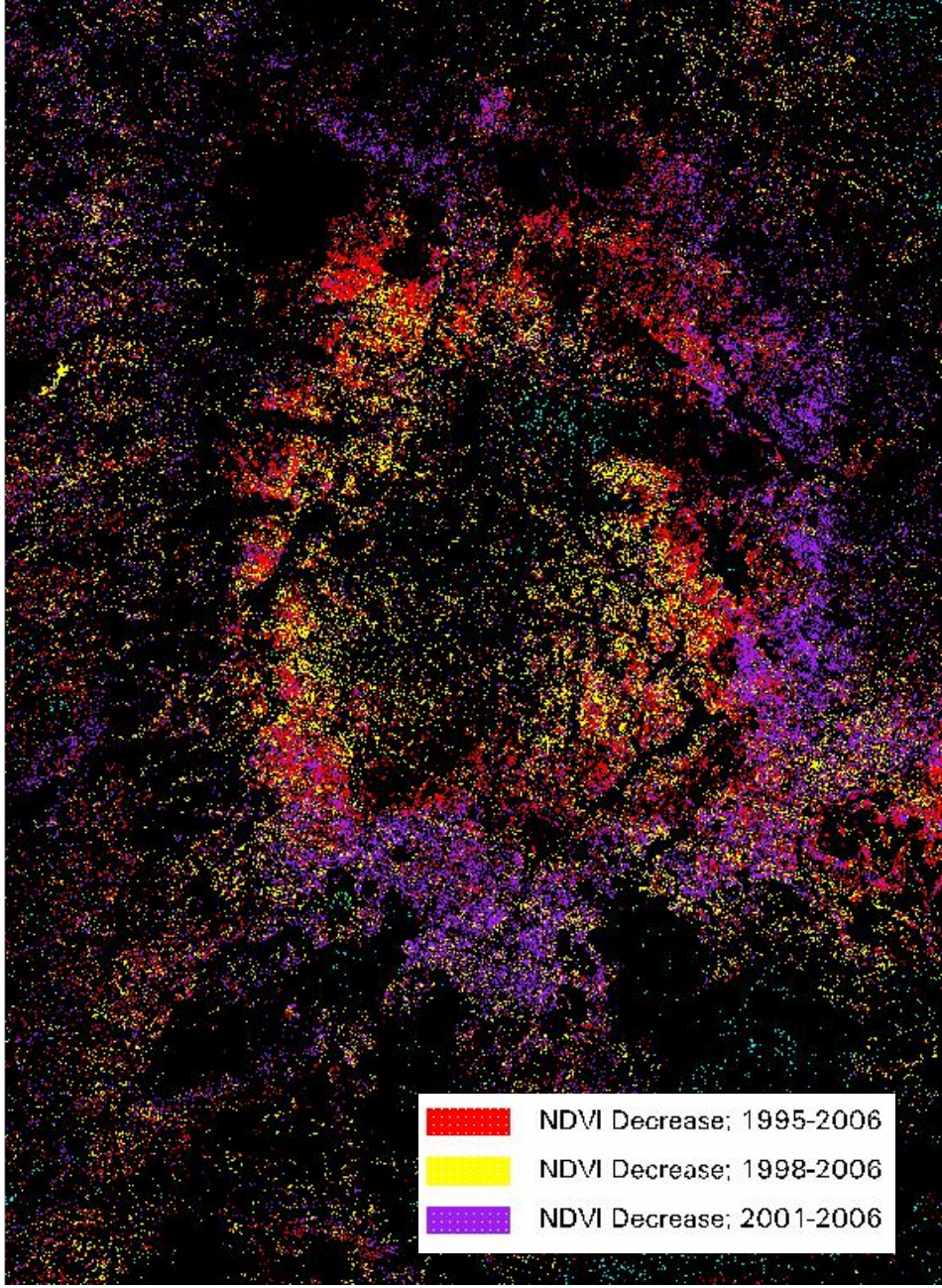


September 30, 2006 TM Image (New Mexico)

LANDFIRE Classification

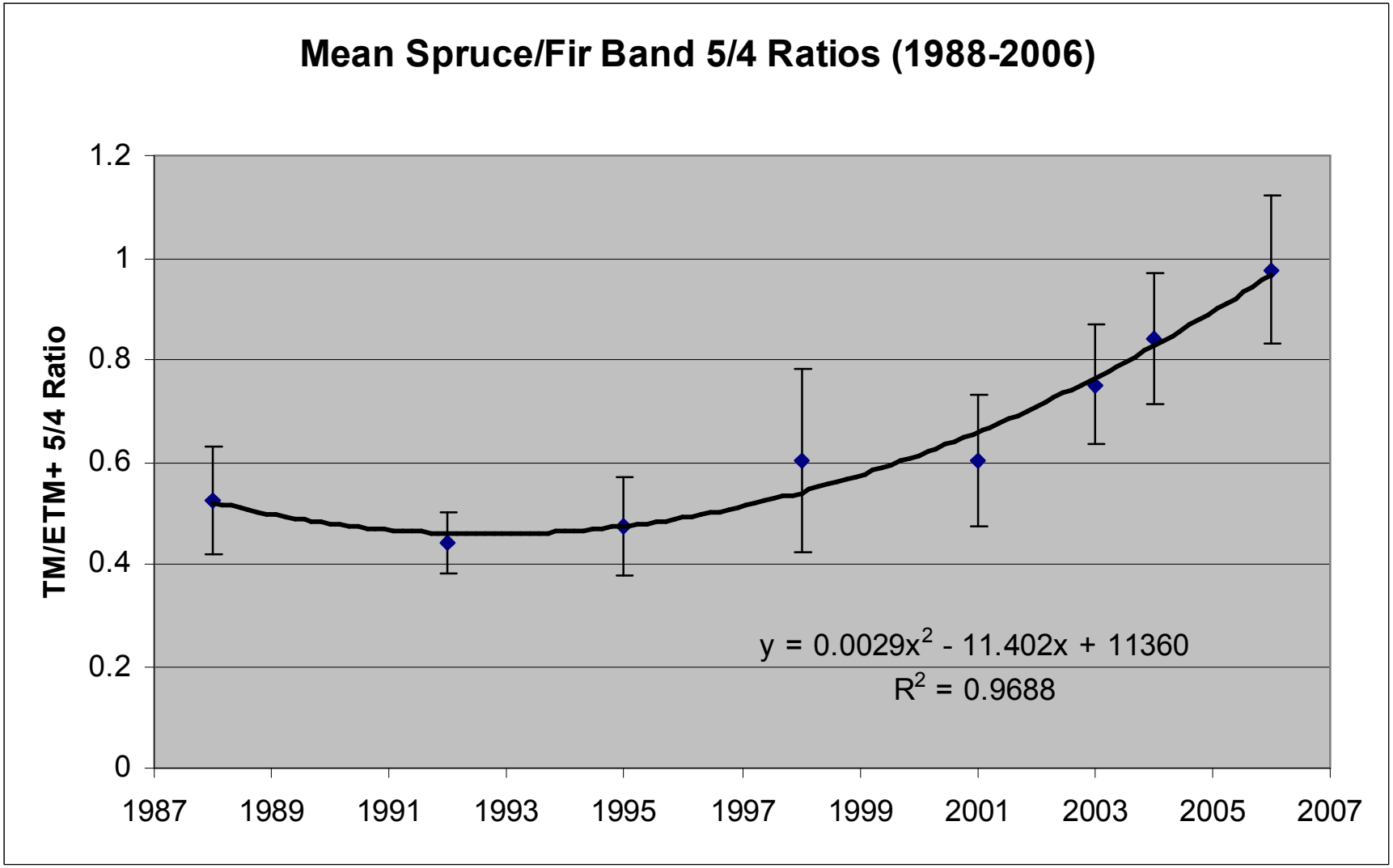

Mean Spruce/Fir NDVI (1988-2006)
NDVI Value
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
y = -0.0012x2 + 4.598x - 4582.1
R2 = 0.9942

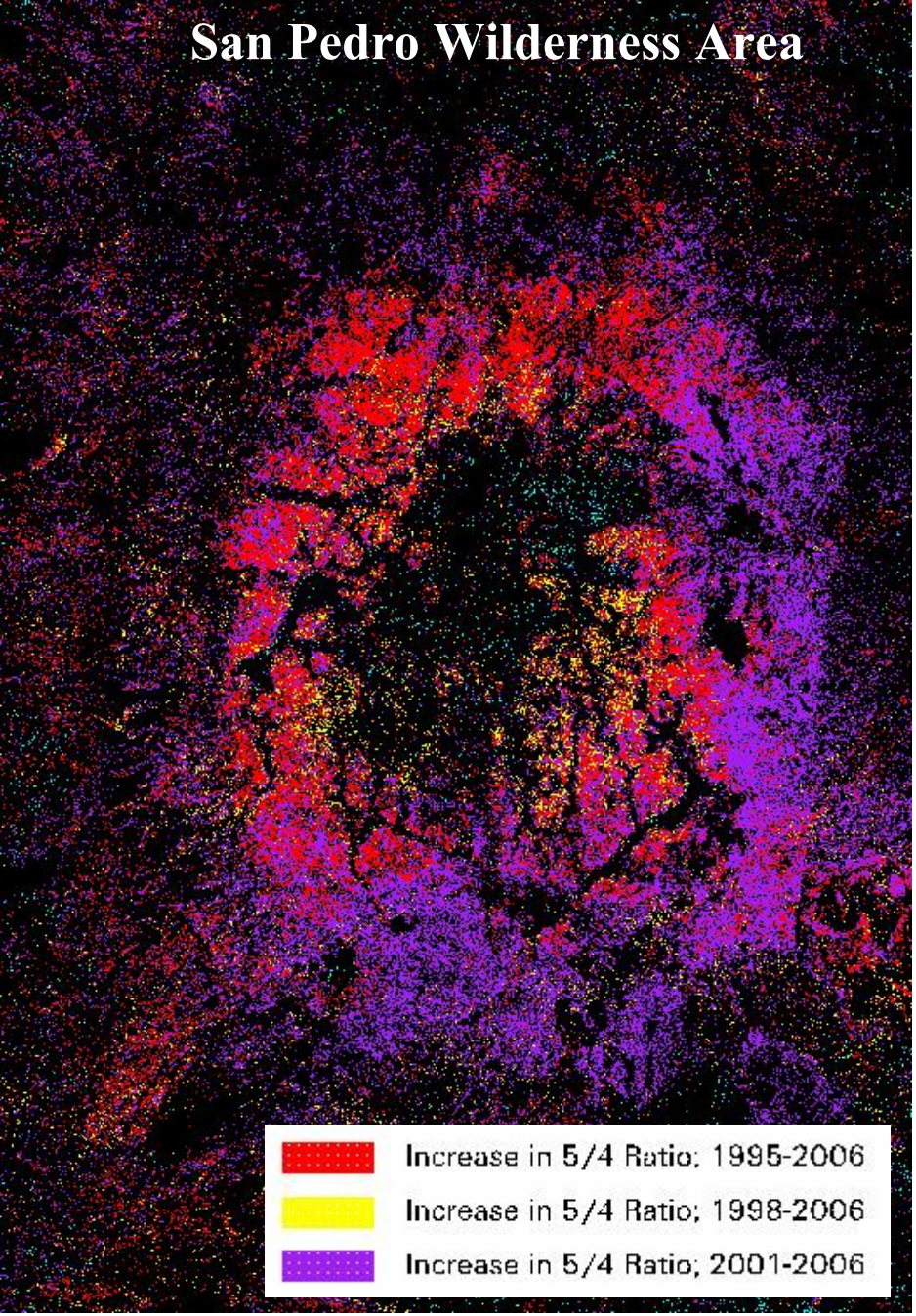

NDVI Trends (1988-2006)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1988
1992
1995
1998
2001
2003
2004
2006
NDVI
Golf Fairways
Spruce/Fir



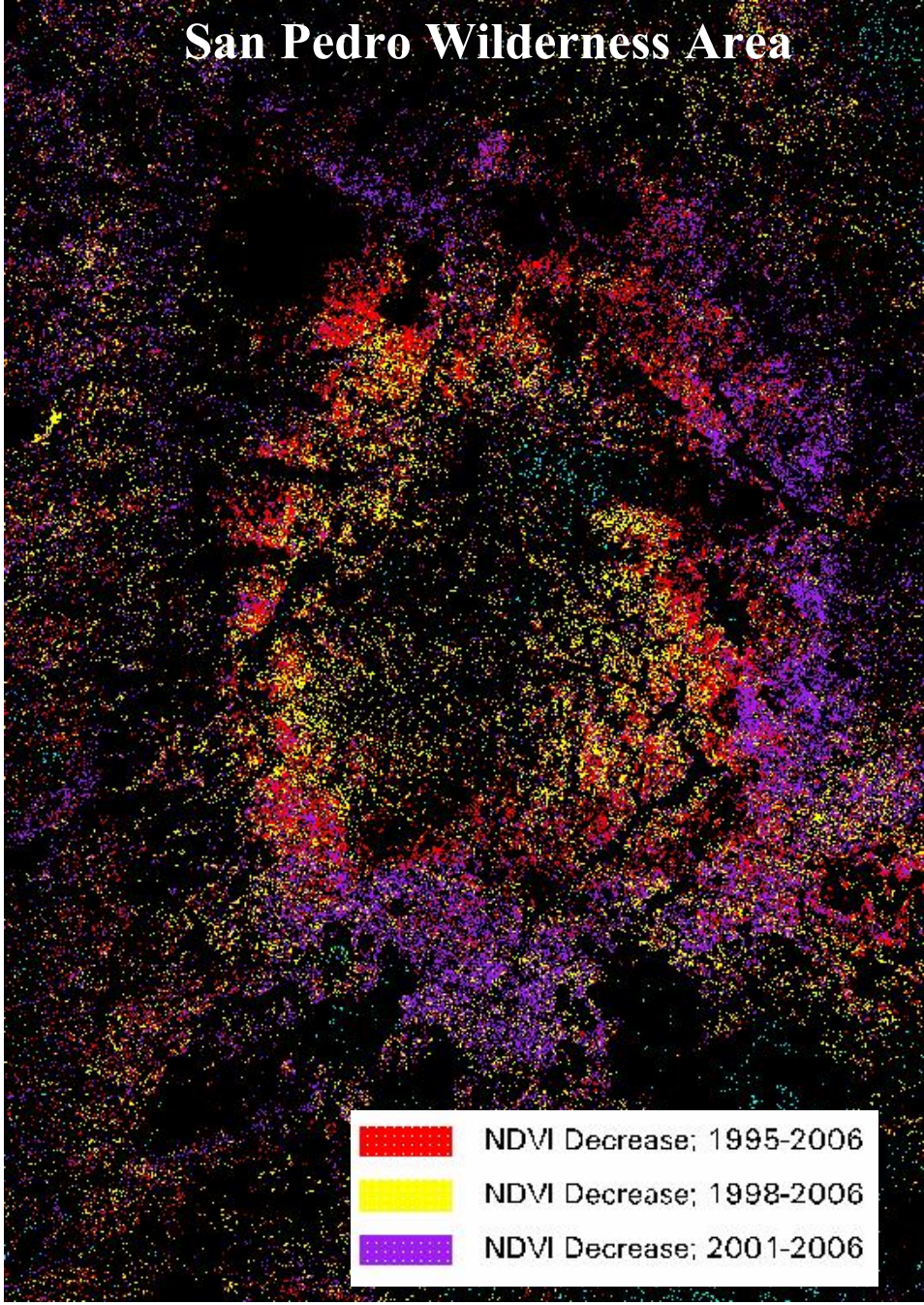
September 30, 2006 TM Image (New Mexico)

NDVI Trends between 1995 and 2006


Mean Spruce/Fir Band 5/4 Ratios (1988-2006)
TM/ETM+ 5/4 Ratio
1.2
1
0.8
0.6
0.4
0.2
0
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
y = 0.0029x2 - 11.402x + 11360
R2 = 0.9688



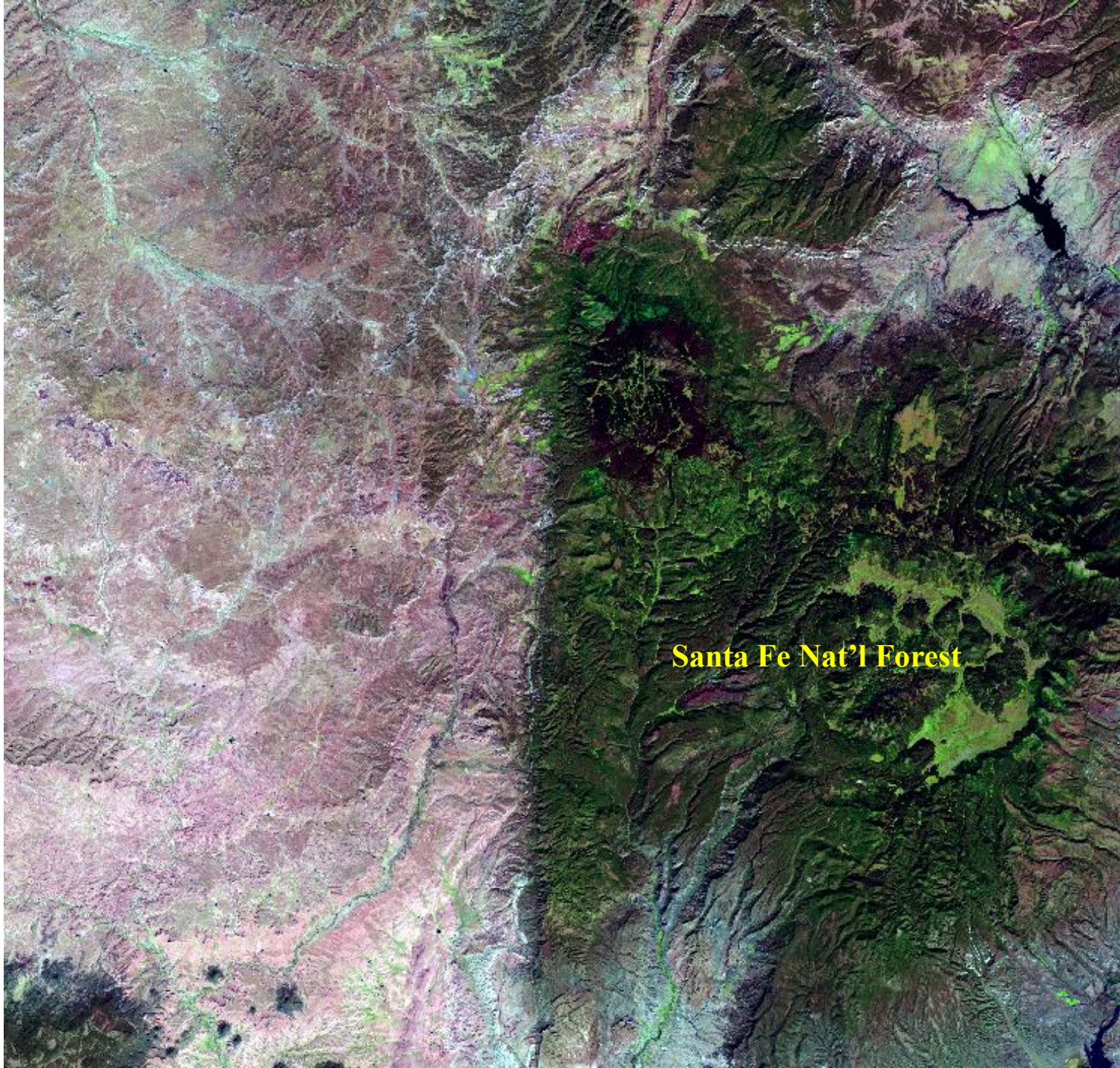
TM 5/4 Ratio Trends between 1995 and 2006



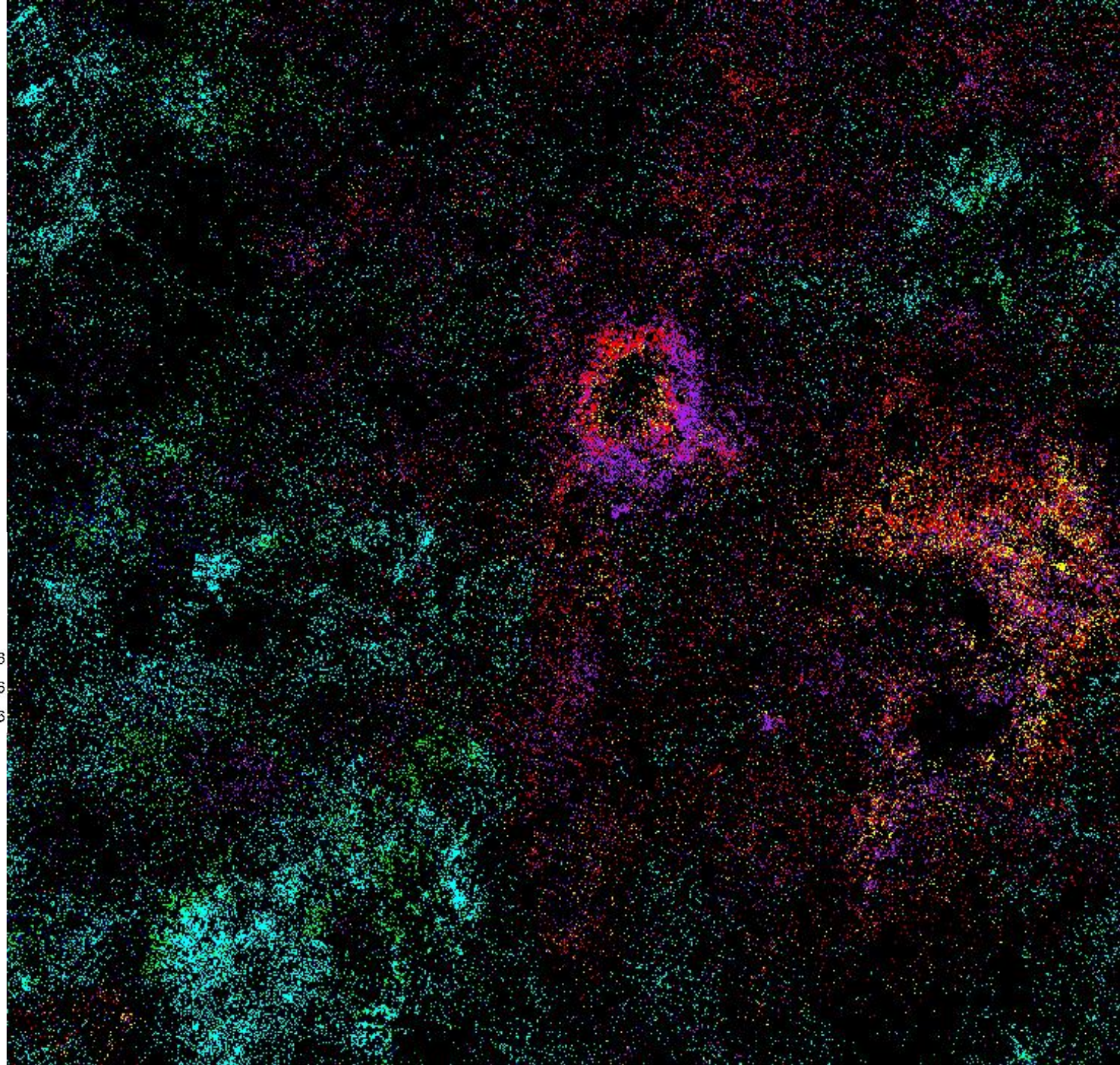
NDVI Trends between 1995 and 2006

Some Next Tasks

- Field checks of areas showing trends
- Expand geographic analysis
- Assess role of other sensors
- Analyze weather data in conjunction with spectral trends data

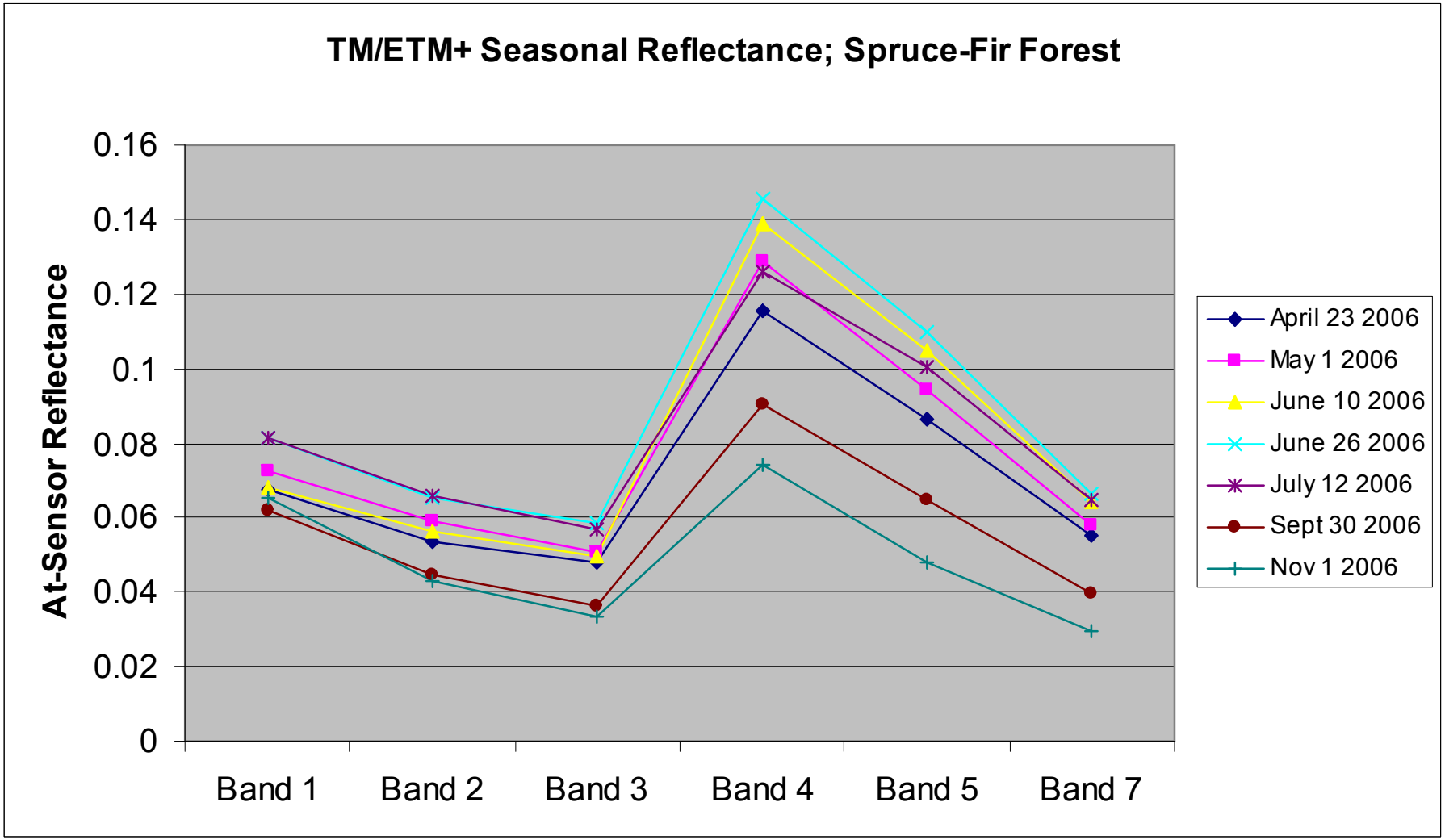

Santa Fe Nat'l Forest

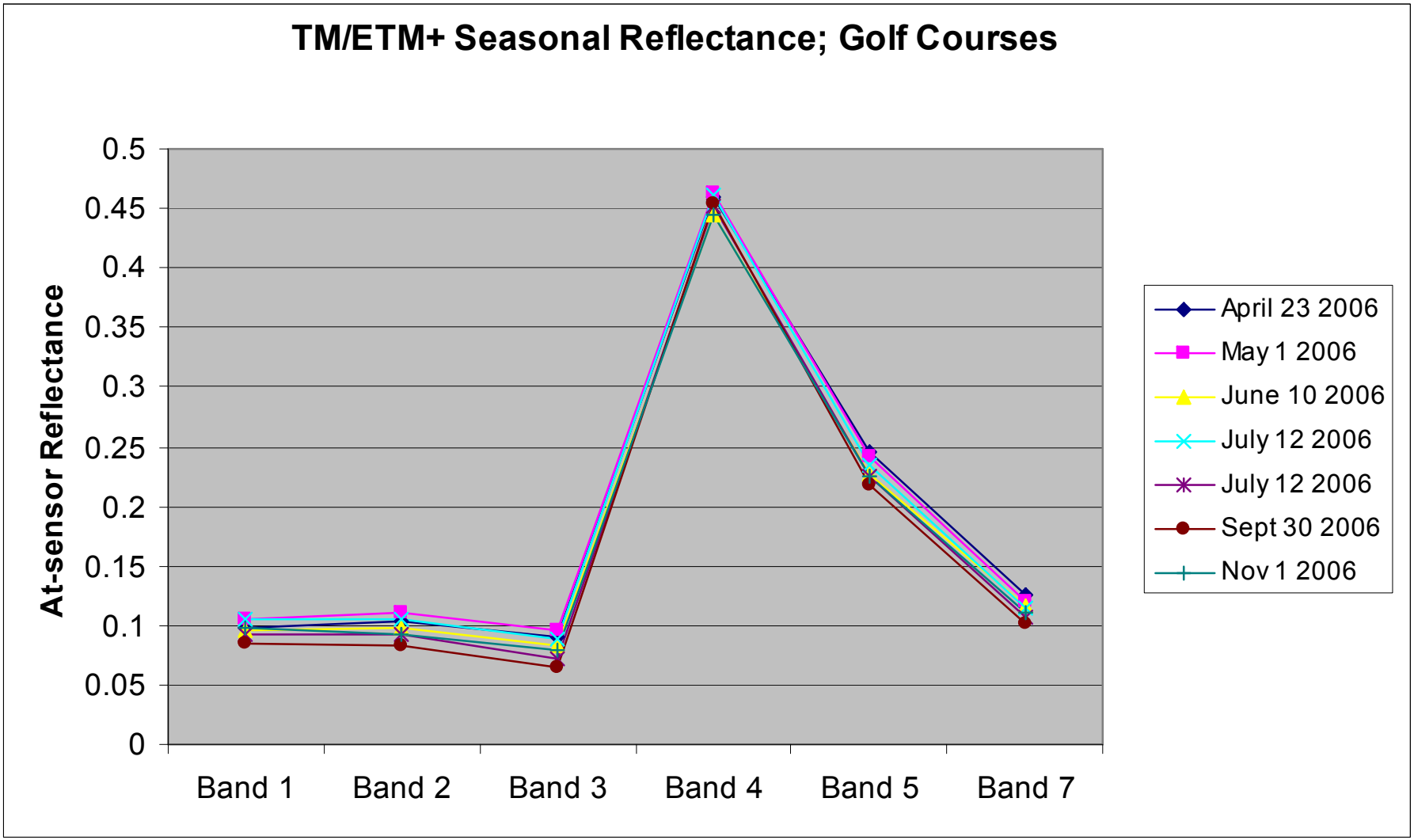
Changes in vegetation status/health in northern New Mexico as depicted by TM 5/4 Ratio

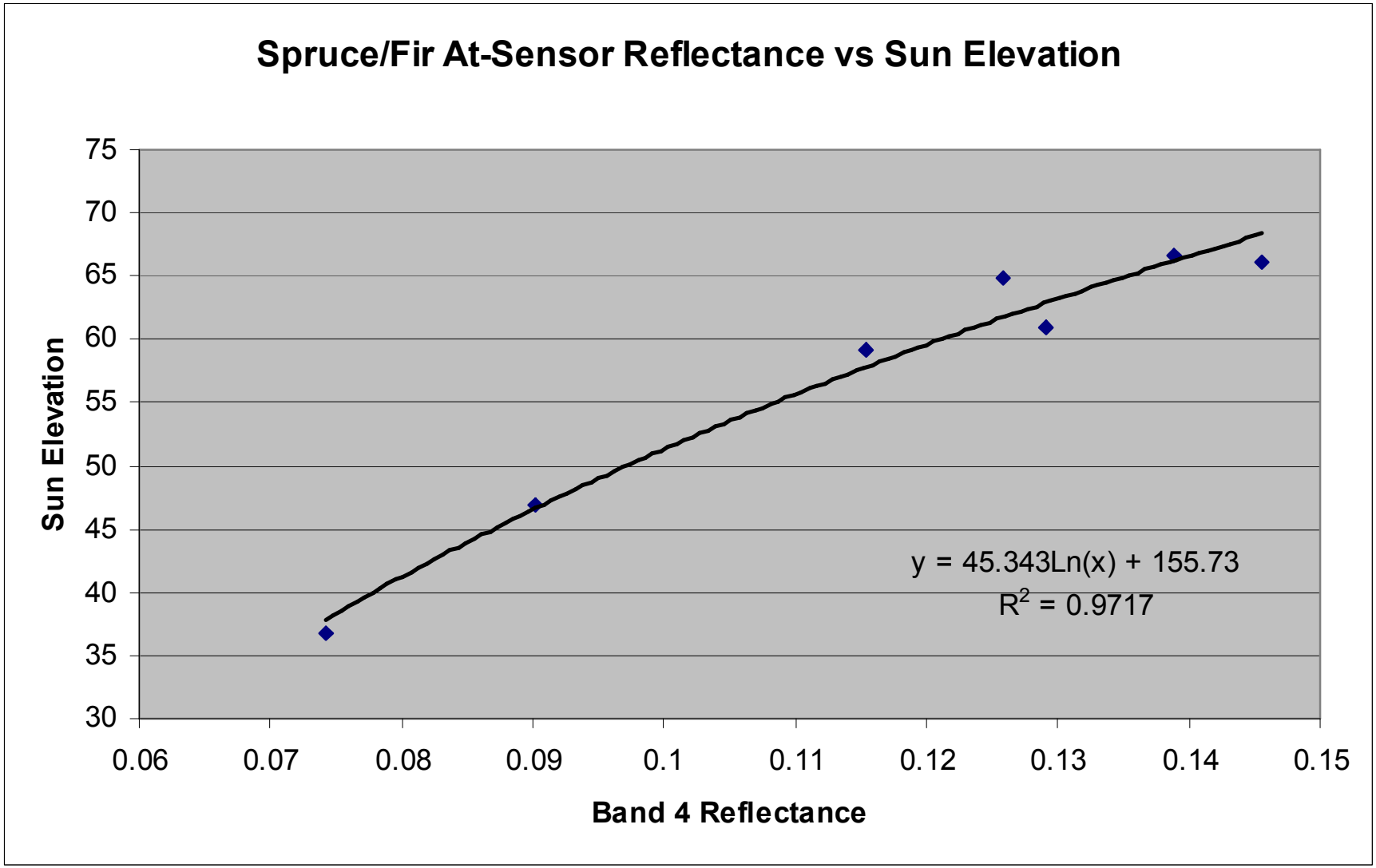


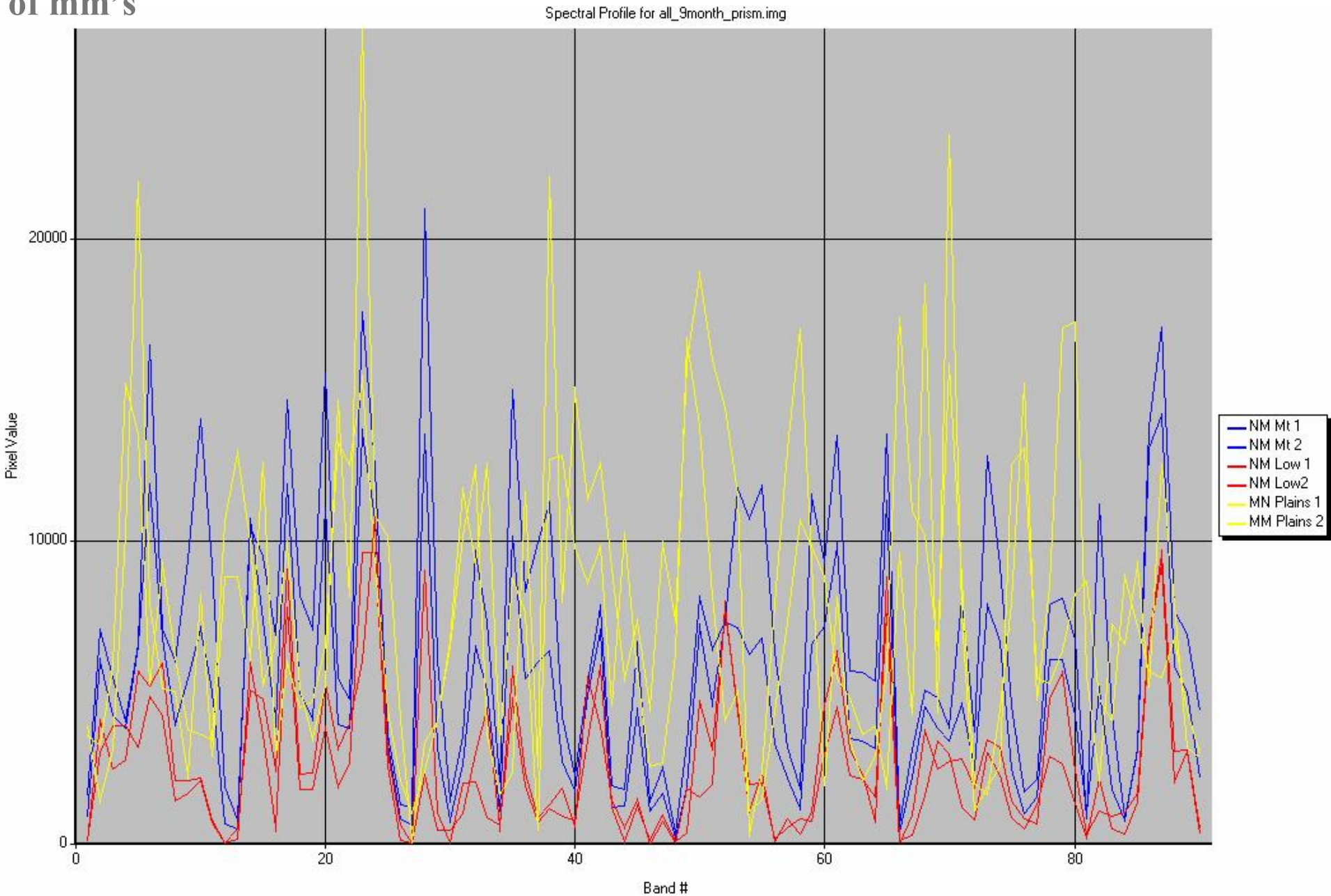
Increase in 5/4 Ratio; 1995-2006
Increase in 5/4 Ratio; 1998-2006
Increase in 5/4 Ratio; 2001-2006

Decrease in 5/4 Ratio; 1995-2006
Decrease in 5/4 Ratio; 1998-2006
Decrease in 5/4 Ratio; 2001-2006


TM/ETM+ Seasonal Reflectance; Spruce-Fir Forest
At-Sensor Reflectance
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Band 1
Band 2
Band 3
Band 4
Band 5
Band 7
April 23 2006
May 1 2006
June 10 2006
June 26 2006
July 12 2006
Sept 30 2006
Nov 1 2006


TM/ETM+ Seasonal Reflectance; Golf Courses
At-sensor Reflectance
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Band 1
Band 2
Band 3
Band 4
Band 5
Band 7
April 23 2006
May 1 2006
June 10 2006
July 12 2006
July 12 2006
Sept 30 2006
Nov 1 2006


Spruce/Fir At-Sensor Reflectance vs Sun Elevation
Sun Elevation
75
70
65
60
55
50
45
40
35
30
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
0.14
0.15
Band 4 Reflectance
y = 45.343Ln(x) + 155.73
R2 = 0.9717

9 Years of Prism Monthly Rainfall Data

1/1000's of mm's