Assessing dNBR in the boreal forest and tundra ecosystems of Alaska's national parks

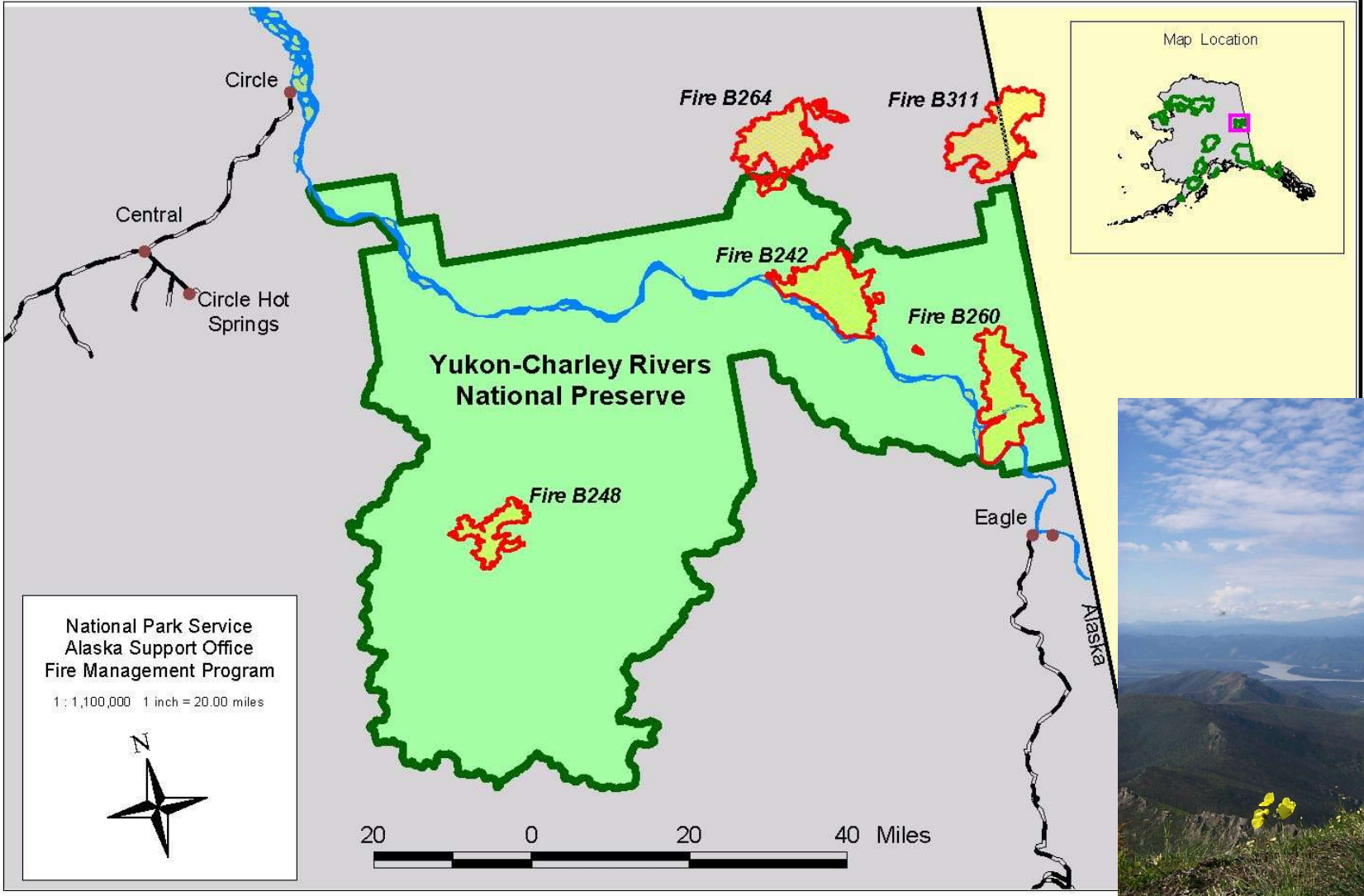
Alaska Burn Severity Workshop

Brian Sorbel and Jennifer Allen

February 20, 2008

Inupiat Heritage Center
Barrow
CHUKCHI SEA
BEAUFORT SEA
Noatak
Cape Krusenstern
Gates of the Arctic
Anaktuvuk Pass
KOTZEBUE SOUND
Kotzebue
Kobuk Valley
Bettles/Evansville
Bering Land Bridge
RUSSIA
UNITED STATES
BERING STRAIT
Nome
NORTON SOUND
Fort Yukon
Circle
Yukon-Charley Rivers
Eagle
Alaska Public Lands Information Center
Fairbanks
Denali
Mt. McKinley 20,320 ft 6194 m
McKinley Park
Tok
Slana
Nabesna
Glennallen
Gakona
Chitina
McCarthy
Wrangell-Saint Elias
Mt. St. Elias 18,008 ft 5489 m
Palmer
Eagle River
Anchorage
Valdez
Cordova
Prince William Sound
Bethel
Lake Clark
Kenai
Soldotna
Seward
Iliamna
Homer
COOK INLET
Kenai Fjords
KUSKOKWIM BAY
Dillingham
King Salmon
Katmai
GULF OF ALASKA
Yakutat
Glacier Bay
Klondike Gold Rush
Skagway
Haines
Gustavus
Juneau
Hoonah
CANADA
UNITED STATES
Sitka
Petersburg
Wrangell
Ketchikan
Dixon Entrance
BRISTOL BAY
Kodiak
BERING SEA
Port Heiden
Aniakchak
Cold Bay
PACIFIC OCEAN
Unalaska
Aleutian World War II National Historic Area
National Park Service and affiliated areas
National Park or National Monument
National Preserve
National Historical Park
Affiliated area
National Wild and Scenic Rivers
1 Alagnak
2 Alatna
3 Aniakchak
4 Charley
5 Chilikadrotna
6 John
7 Kobuk
8 Mulchatna
9 Noatak
10 Koyukuk (North Fork)
11 Salmon
12 Tinayguk
13 Tlikakila
0 200 Kilometers
0 200 Miles

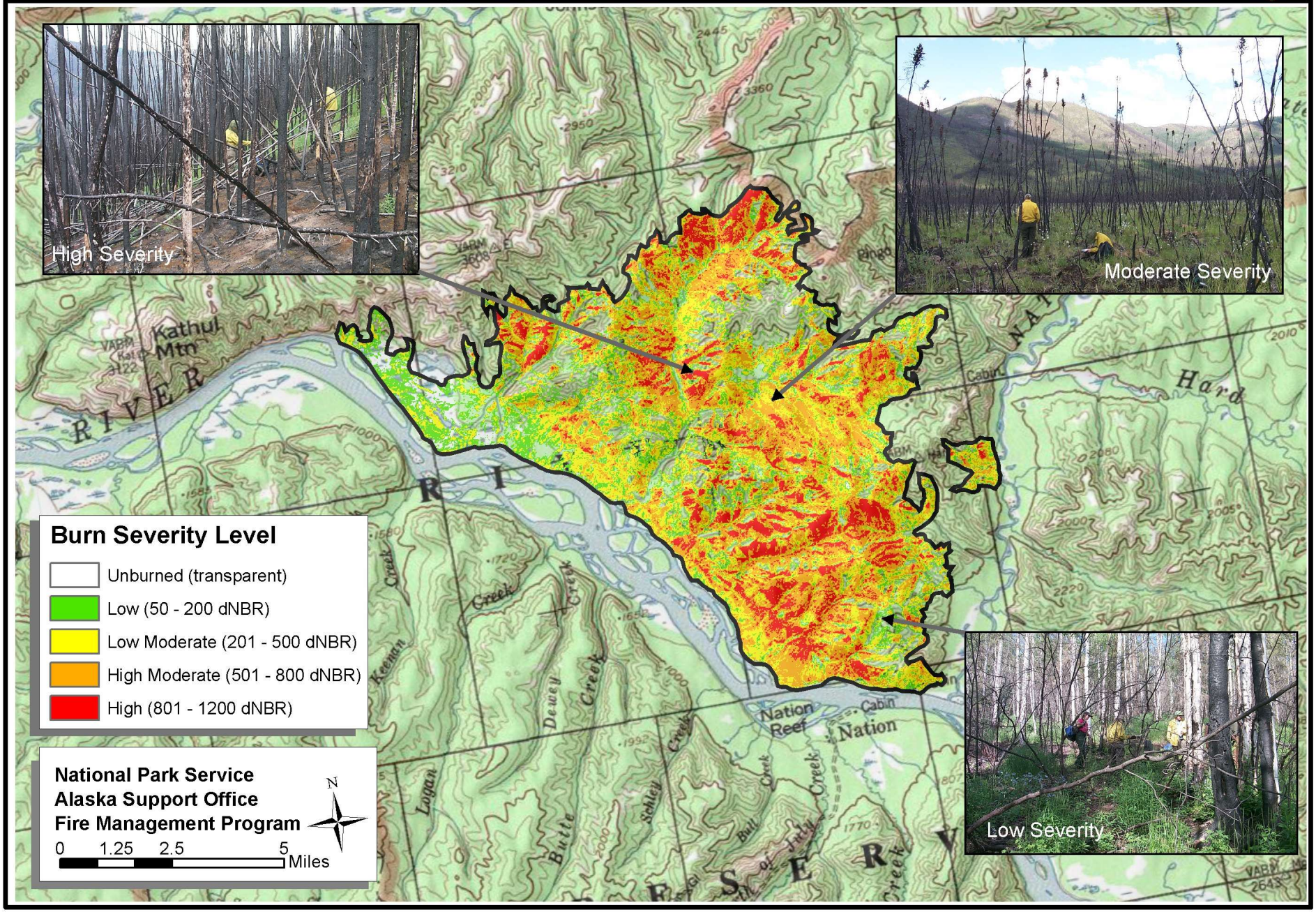
Yukon-Charley Rivers National Preserve
1999 Fires



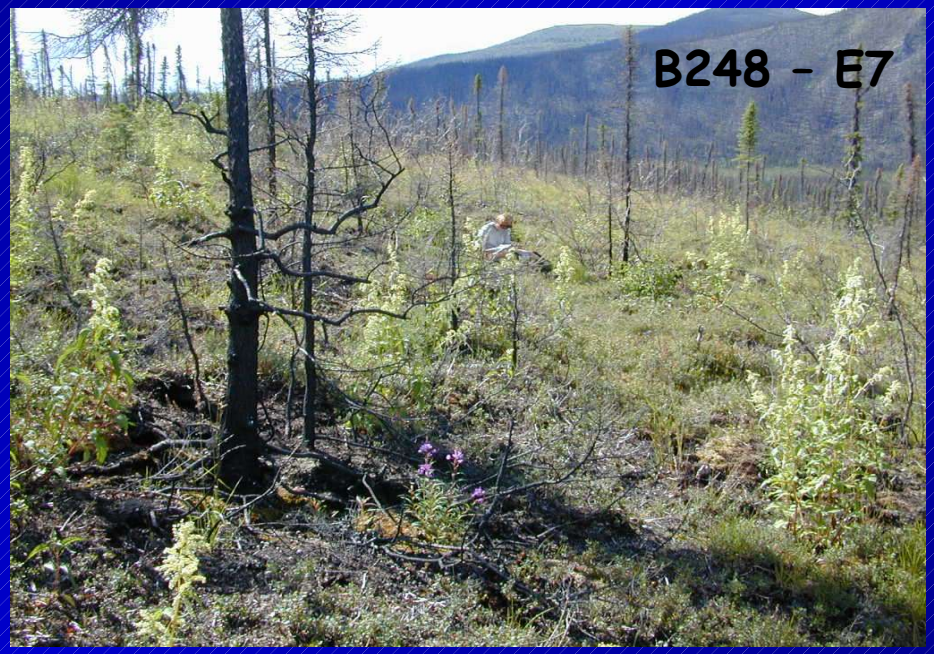
Plot date: October 22, 2001 c:\fire-gis\carto\akso\01_fall_fire_review\maps.apr

Yukon Charley Rivers National Preserve, Alaska
1999 Fire B242 - Burn Severity

National Park Service
U.S. Department of the Interior



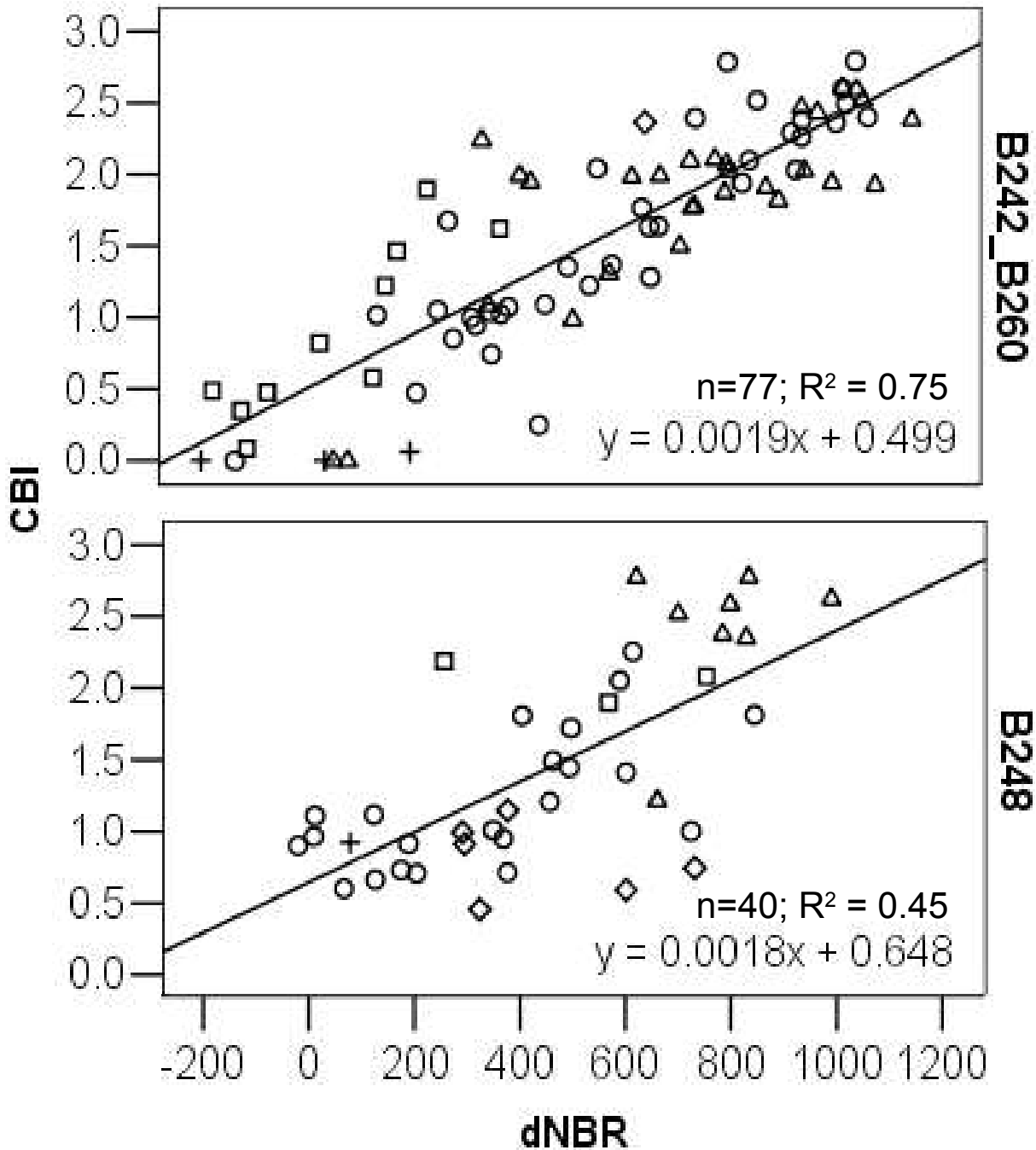
CBI = 0.49 dNBR = -176



CBI = 1.11 dNBR = 10

CBI = 2.02 dNBR = 792

CBI = 2.79 dNBR = 1040


CBI
3.0
2.5
2.0
1.5
1.0
0.5
0.0
B242_B260
n=77; R² = 0.75
y = 0.0019x + 0.499
B248
n=40; R² = 0.45
y = 0.0018x + 0.648
-200
0
200
400
600
800
1000
1200
dNBR

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Iliamna
Homer
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KUSKOKWIM BAY
Dillingham
King Salmon
Katmai
GULF OF ALASKA
Yakutat
Glacier Bay
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Skagway
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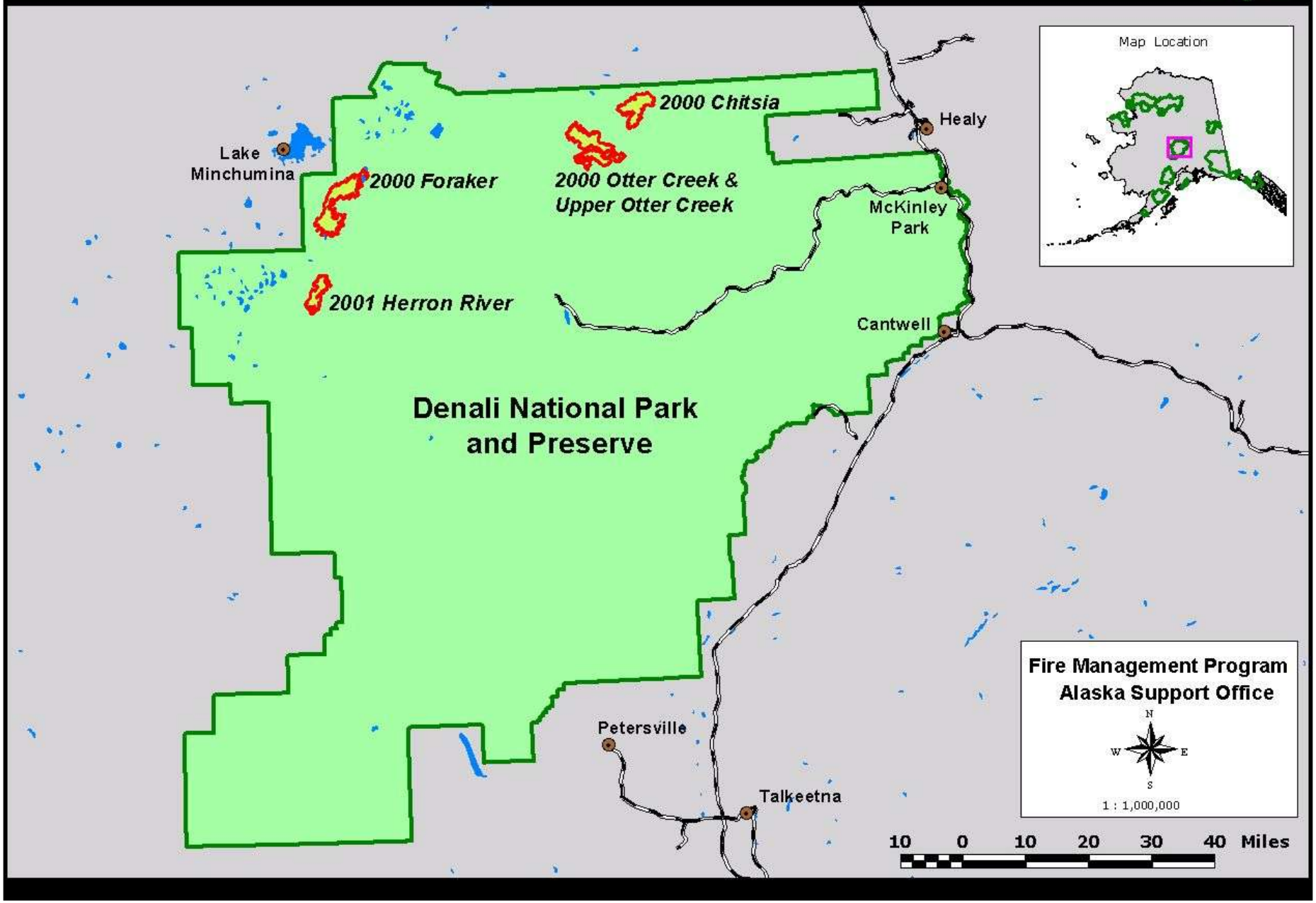
11 Salmon
12 Tinayguk
13 Tlikakila
0 200 Kilometers
0 200 Miles

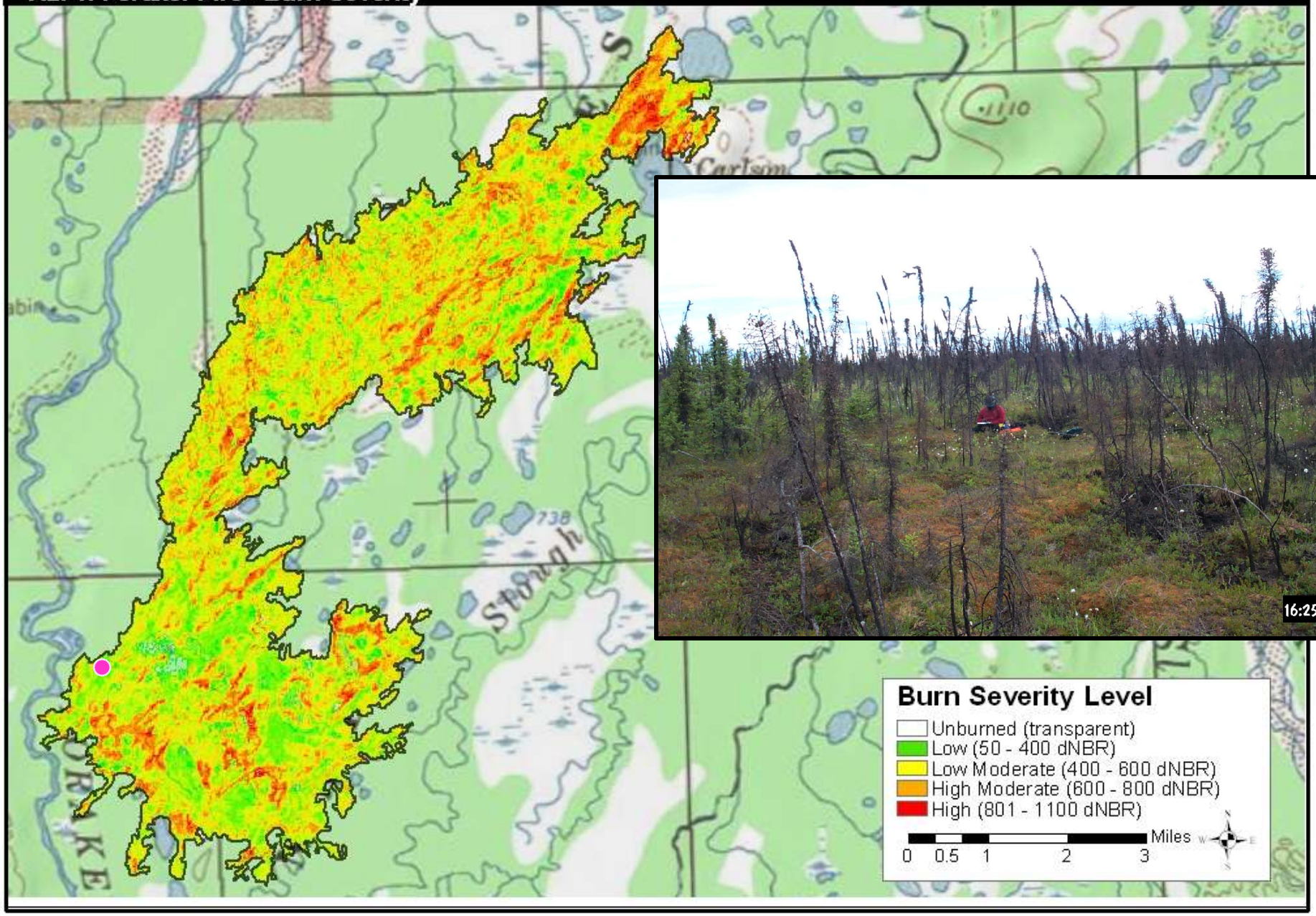
Denali National Park & Preserve

2000 and 2001 Fires



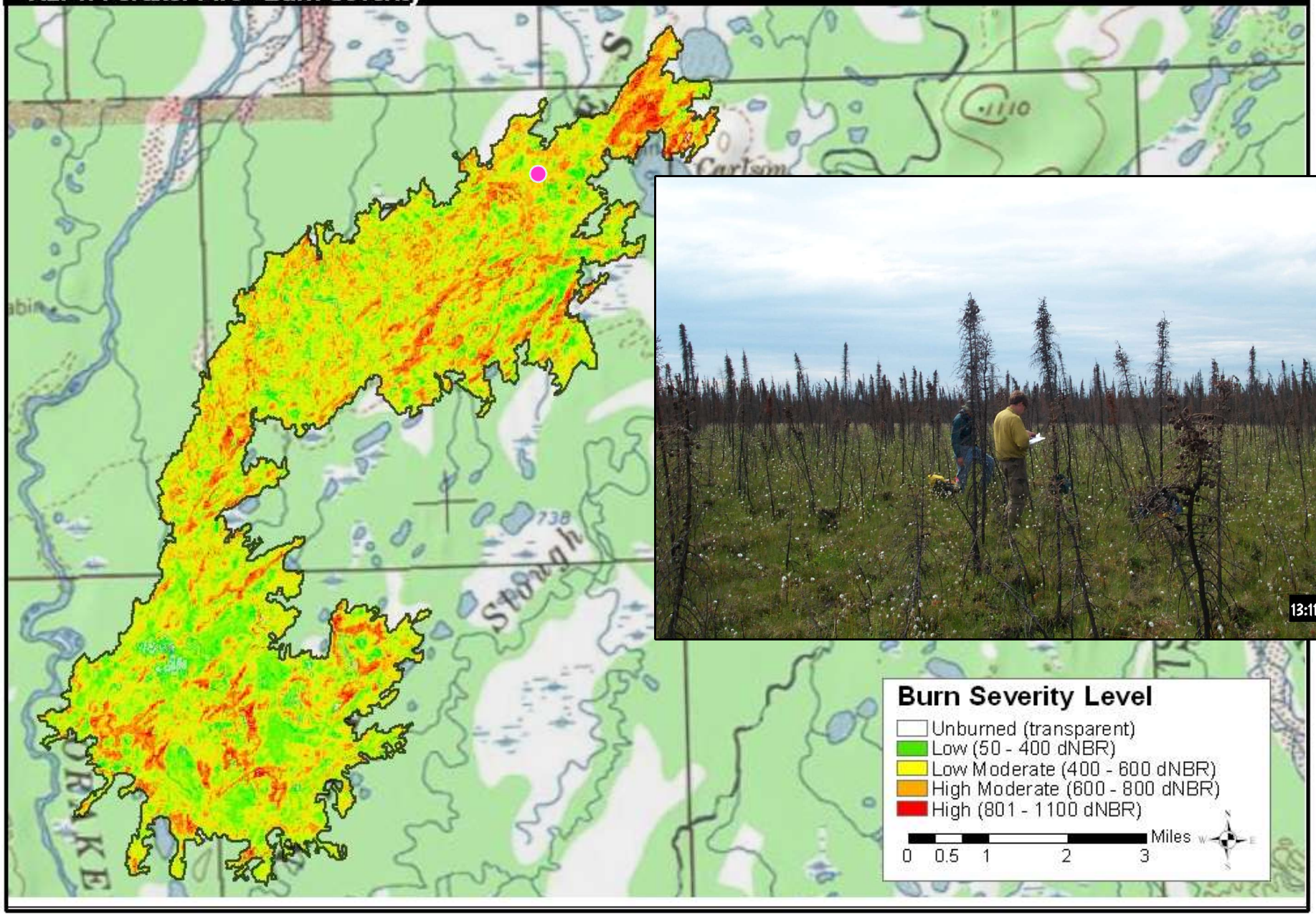
Denali National Park and Preserve

A274: Foraker Fire - Burn Severity



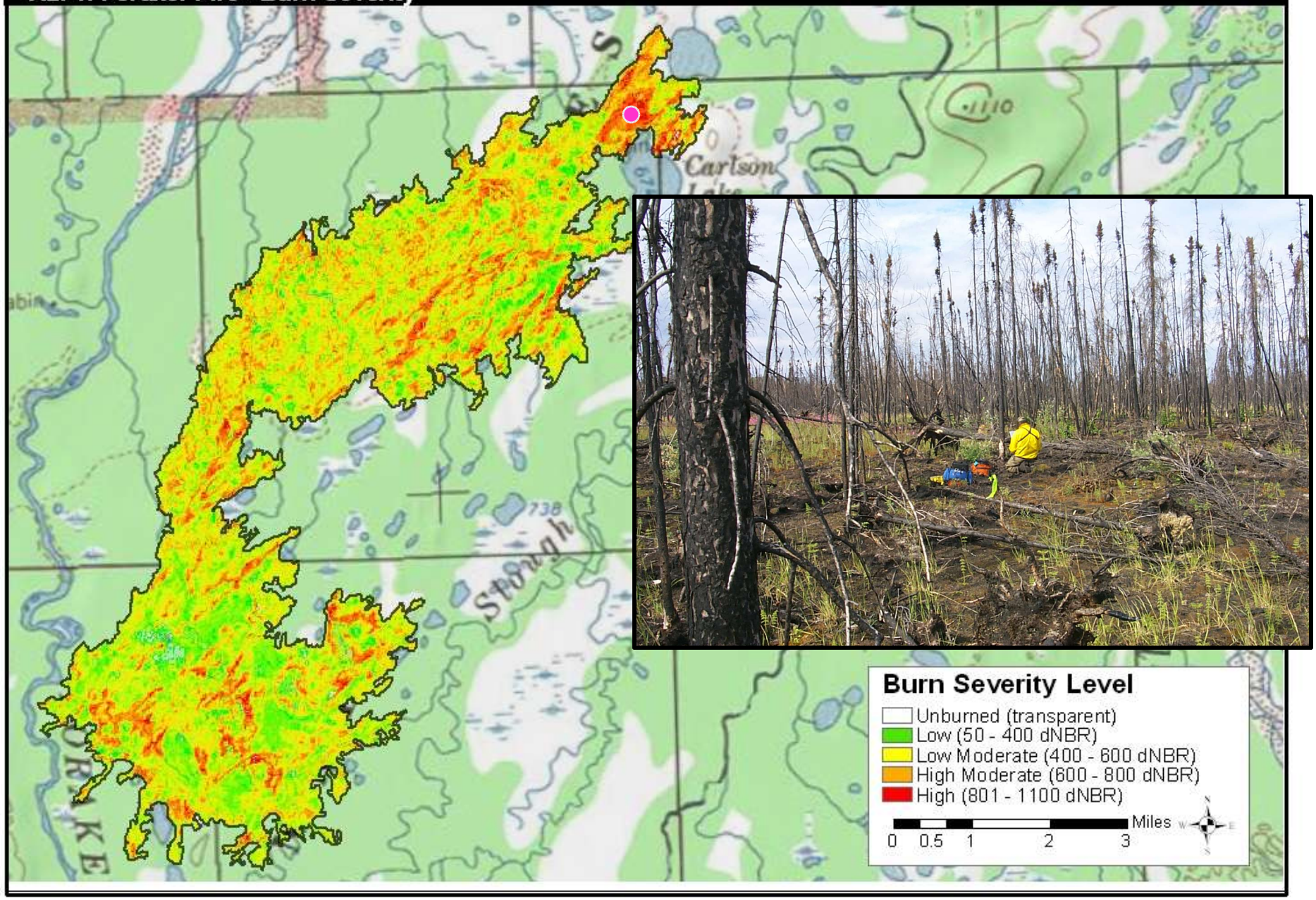
Denali National Park and Preserve

A274: Foraker Fire - Burn Severity



Denali National Park and Preserve

A274: Foraker Fire - Burn Severity

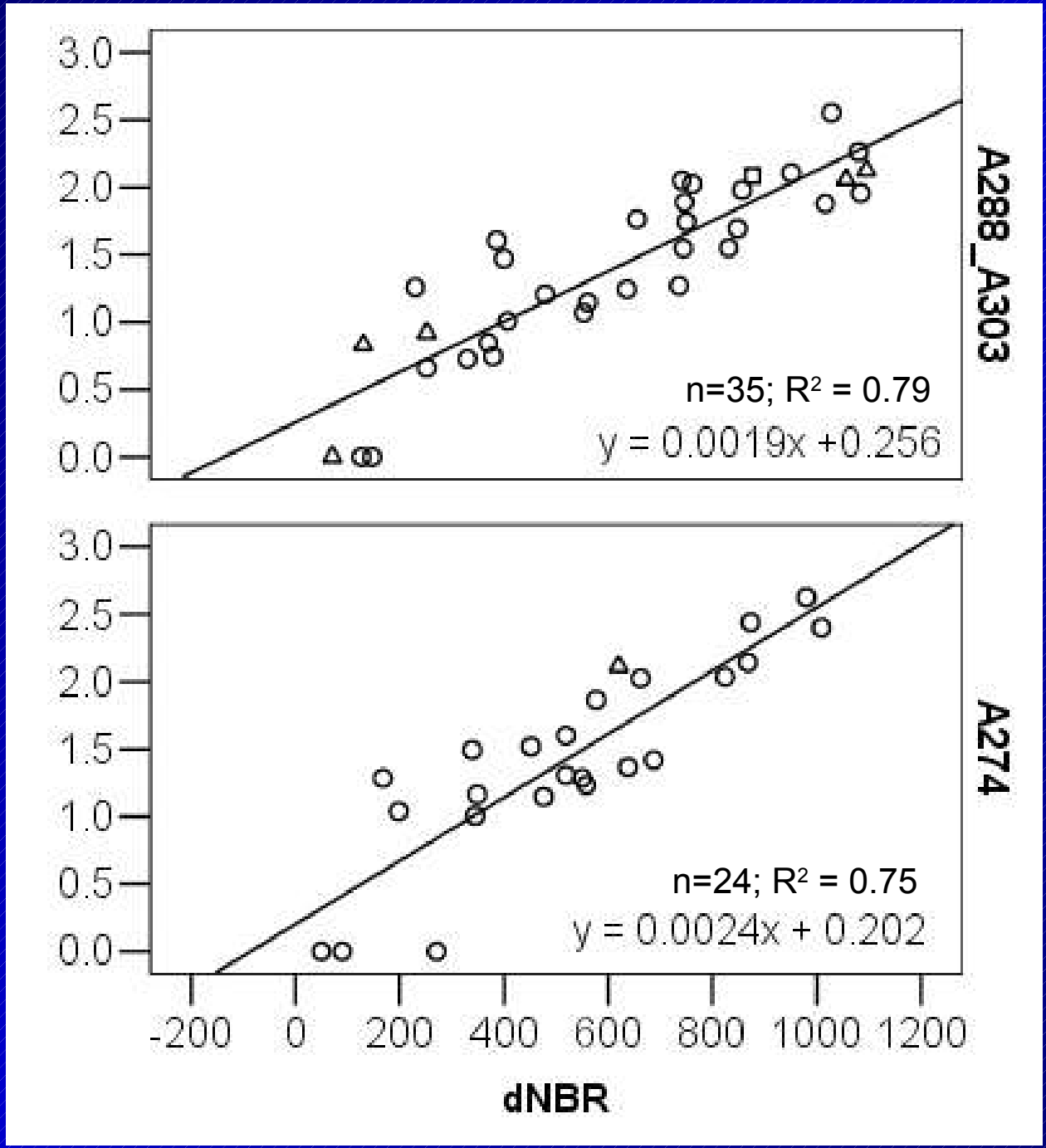


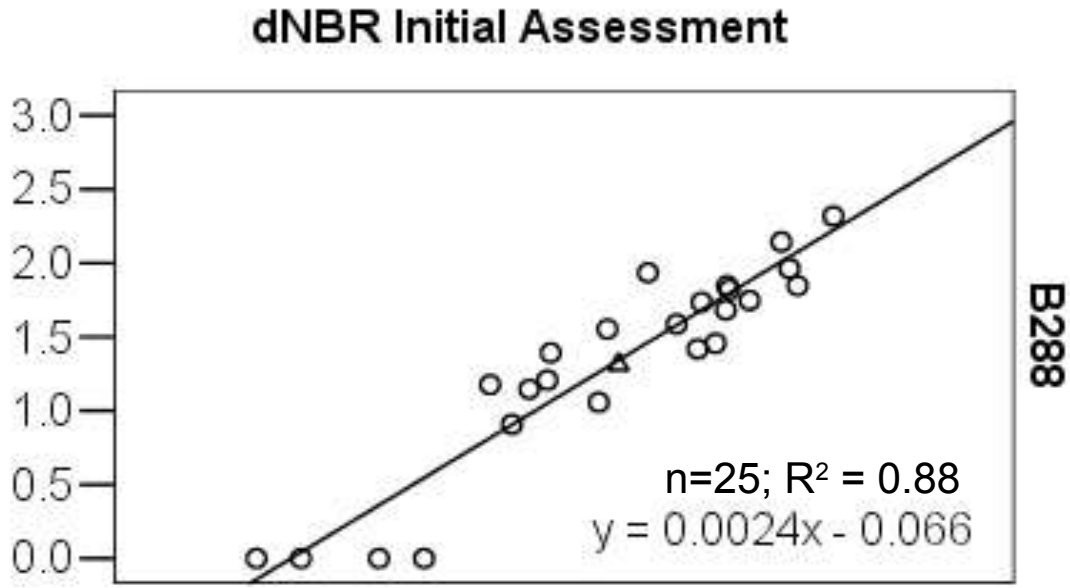
A303 B7
CBI = 0.83
dNBR = 130

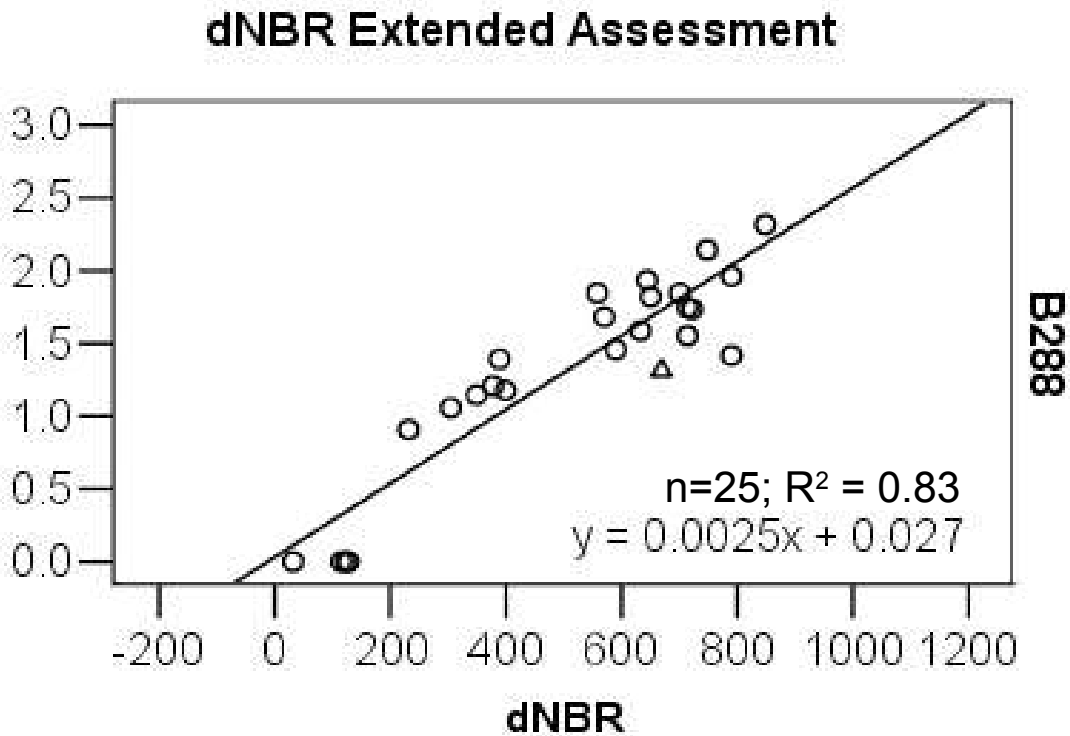
B288 YY5 **CBI = 1.55 dNBR = 379**

A303 B10
CBI = 1.89
dNBR = 664

A274 H9
CBI = 2.63
dNBR = 980


3.0
2.5
2.0
1.5
1.0
0.5
0.0
A288_A303
n=35; R² = 0.79
y = 0.0019x +0.256
3.0
2.5
2.0
1.5
1.0
0.5
0.0
A274
n=24; R² = 0.75
y = 0.0024x + 0.202
-200
0
200
400
600
800
1000
1200
dNBR


dNBR Initial Assessment
3.0
2.5
2.0
1.5
1.0
0.5
0.0
B288
n=25; R² = 0.88
y = 0.0024x - 0.066


dNBR Extended Assessment
3.0
2.5
2.0
1.5
1.0
0.5
0.0
B288
n=25; R² = 0.83
y = 0.0025x + 0.027
-200
0
200
400
600
800
1000
1200
dNBR

Inupiat Heritage Center
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Homer
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King Salmon
Katmai
GULF OF ALASKA
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Klondike Gold Rush
Skagway
Haines
Gustavus
Juneau
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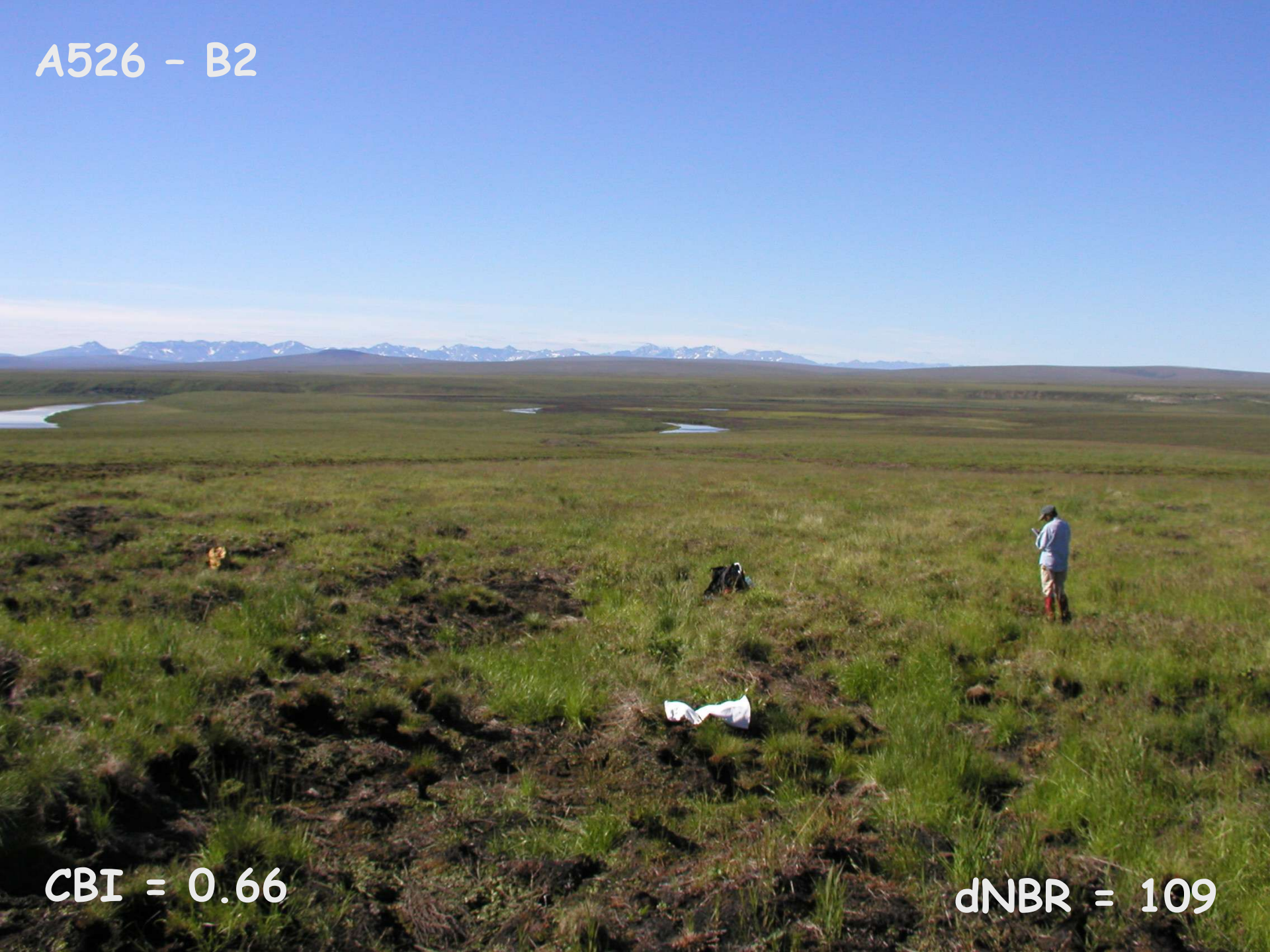
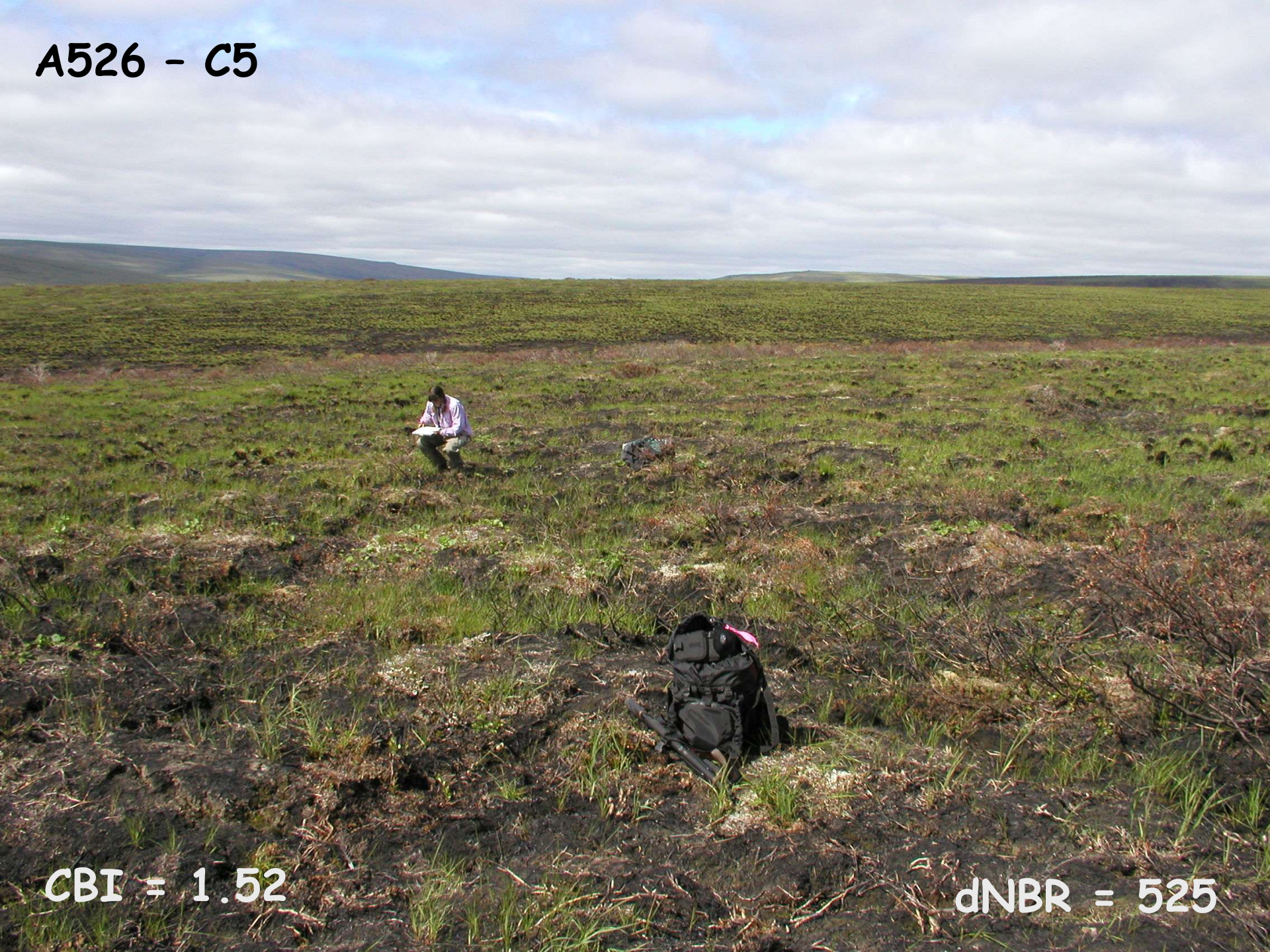
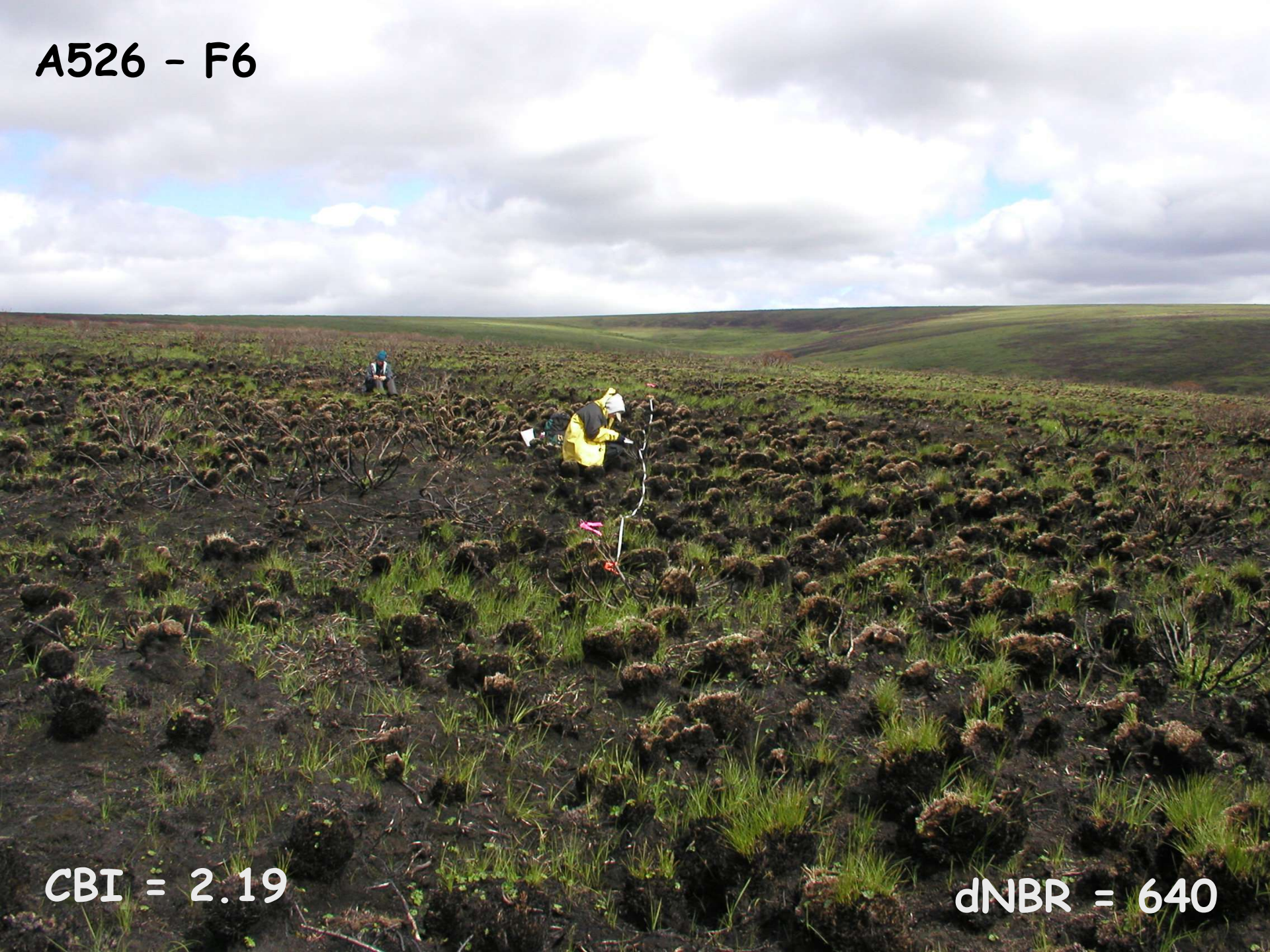
12 Tinayguk
13 Tlikakila
0 200 Kilometers
0 200 Miles

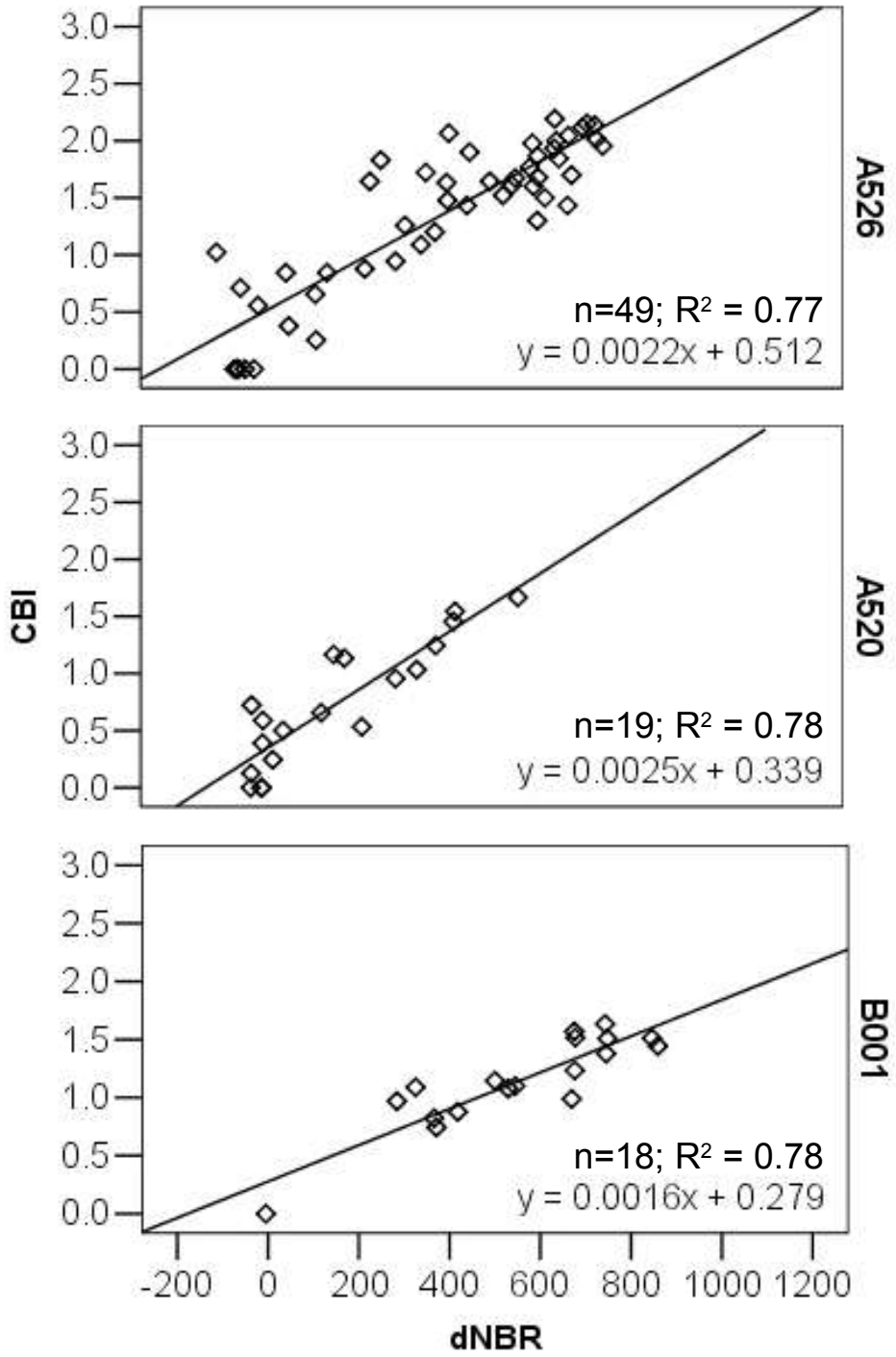
Burn Severity Fieldwork 2003

National Park Service
U.S. Department of the Interior

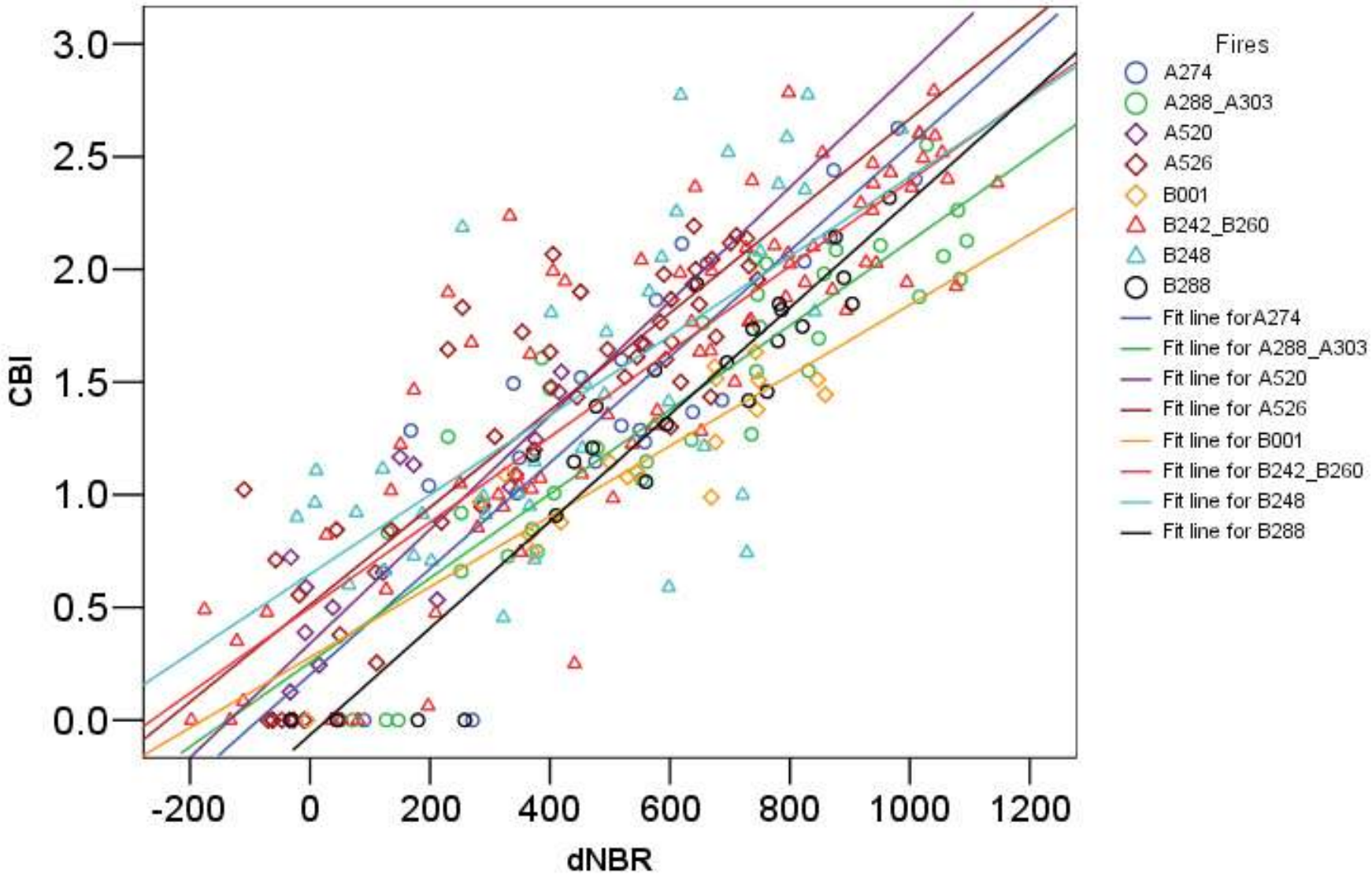

A526 - B2
CBI = 0.66
dNBR = 109

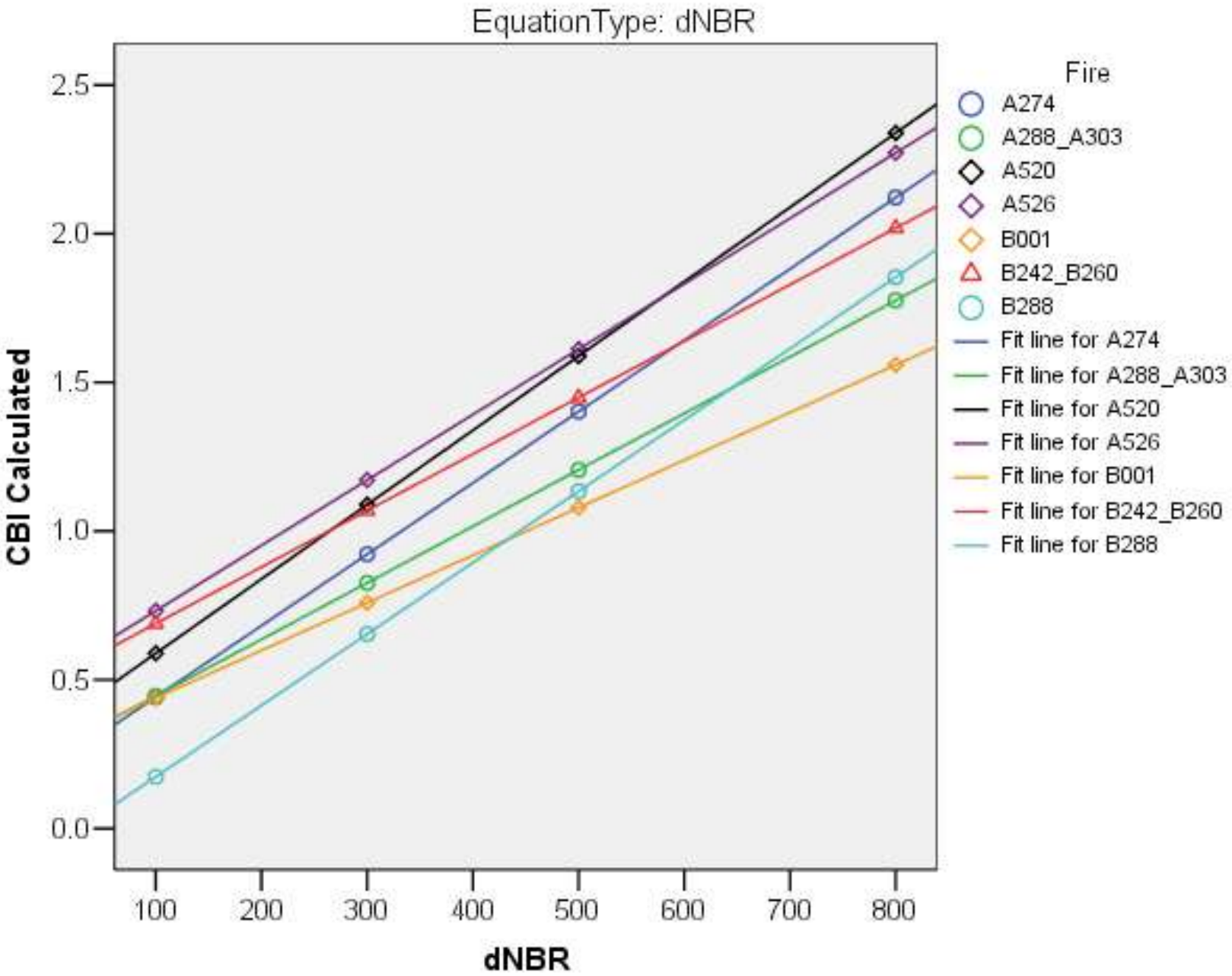

A526 - C5
CBI = 1.52
dNBR = 525


A526 – F6
CBI = 2.19
dNBR = 640

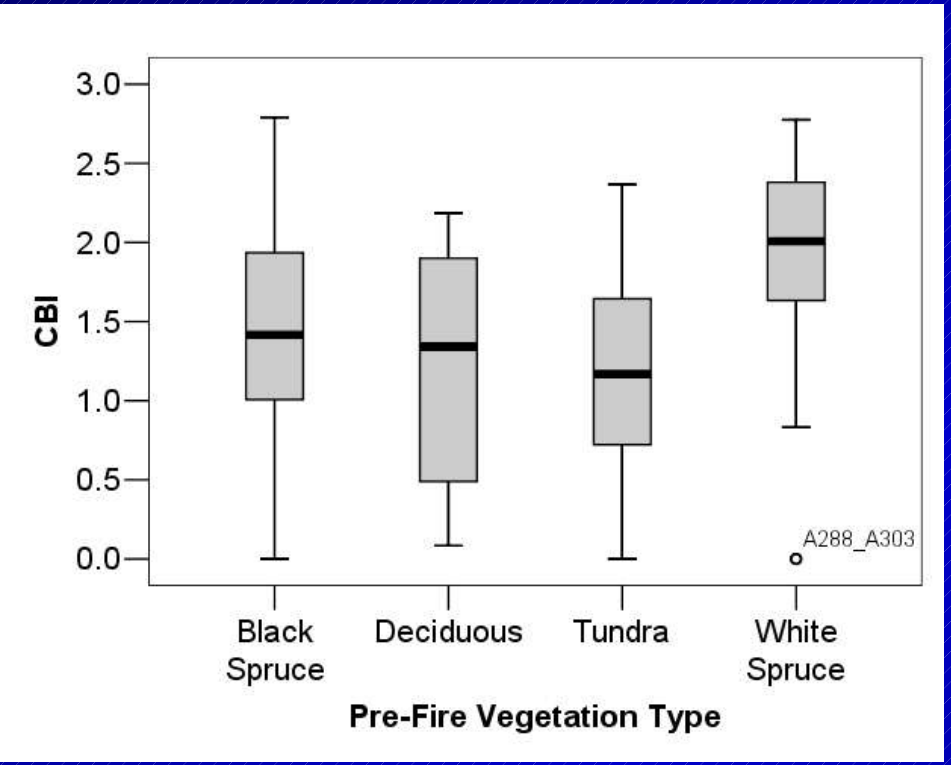

A526
n=49; R² = 0.77
y = 0.0022x + 0.512
A520
n=19; R² = 0.78
y = 0.0025x + 0.339
B001
n=18; R² = 0.78
y = 0.0016x + 0.279
CBI
dNBR
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-200
0
200
400
600
800
1000
1200

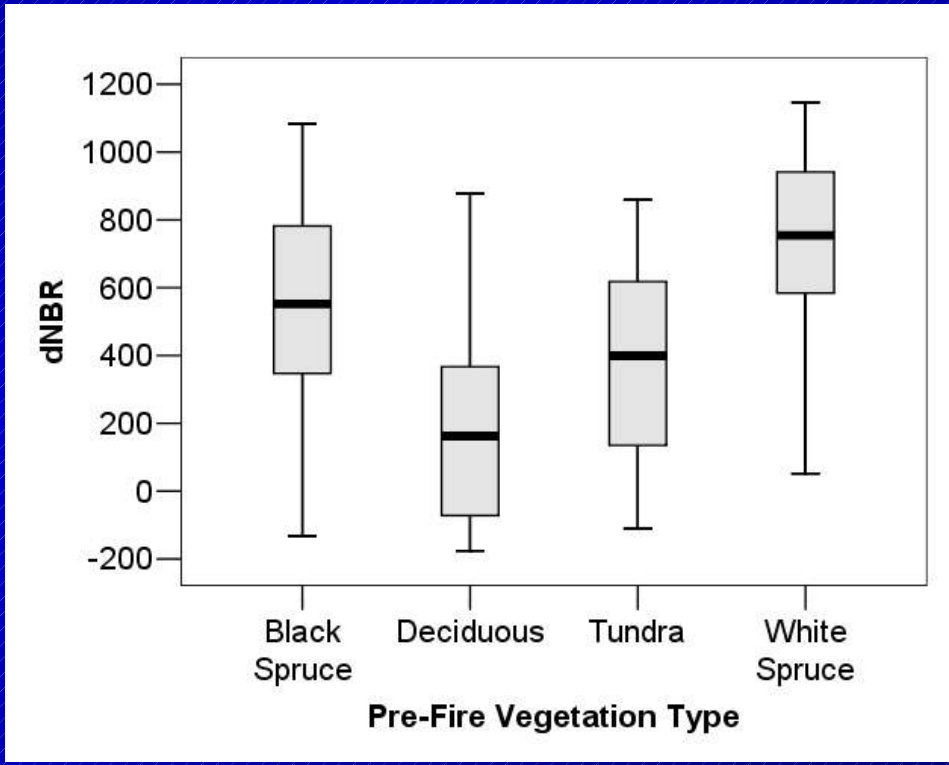
Significant difference among fires



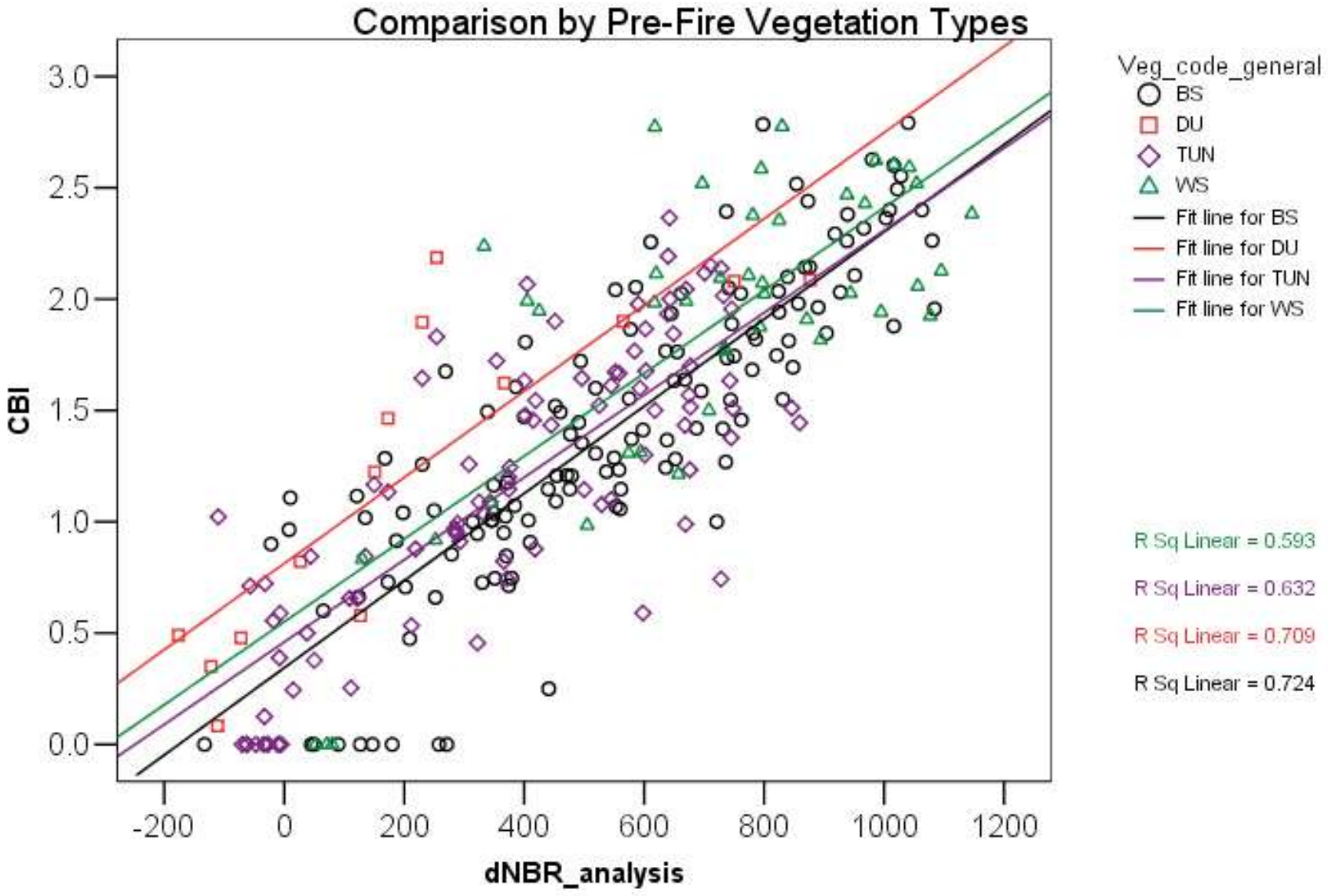

EquationType: dNBR
CBI Calculated
dNBR
2.5
2.0
1.5
1.0
0.5
0.0
100
200
300
400
500
600
700
800
Fire
A274
A288_A303
A520
A526
B001
B242_B260
B288
Fit line for A274
Fit line for A288_A303
Fit line for A520
Fit line for A526
Fit line for B001
Fit line for B242_B260
Fit line for B288

Comparison of Pre-fire Vegetation



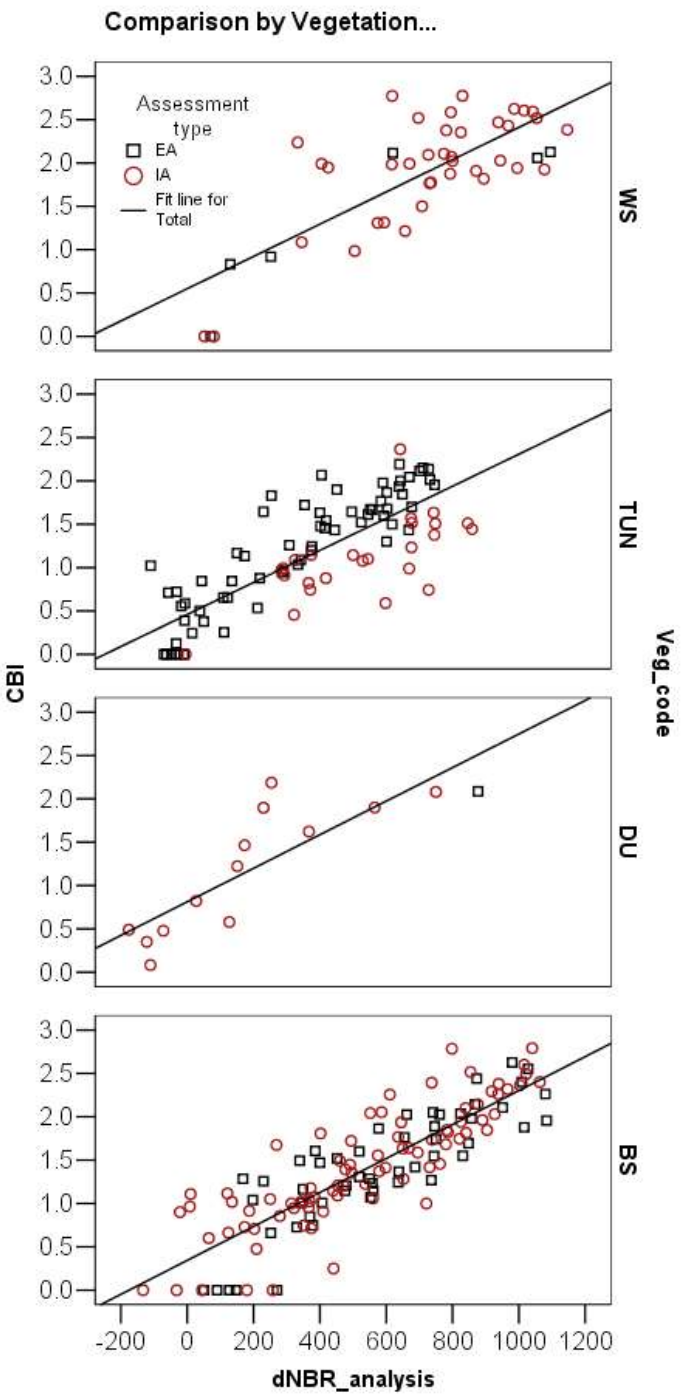


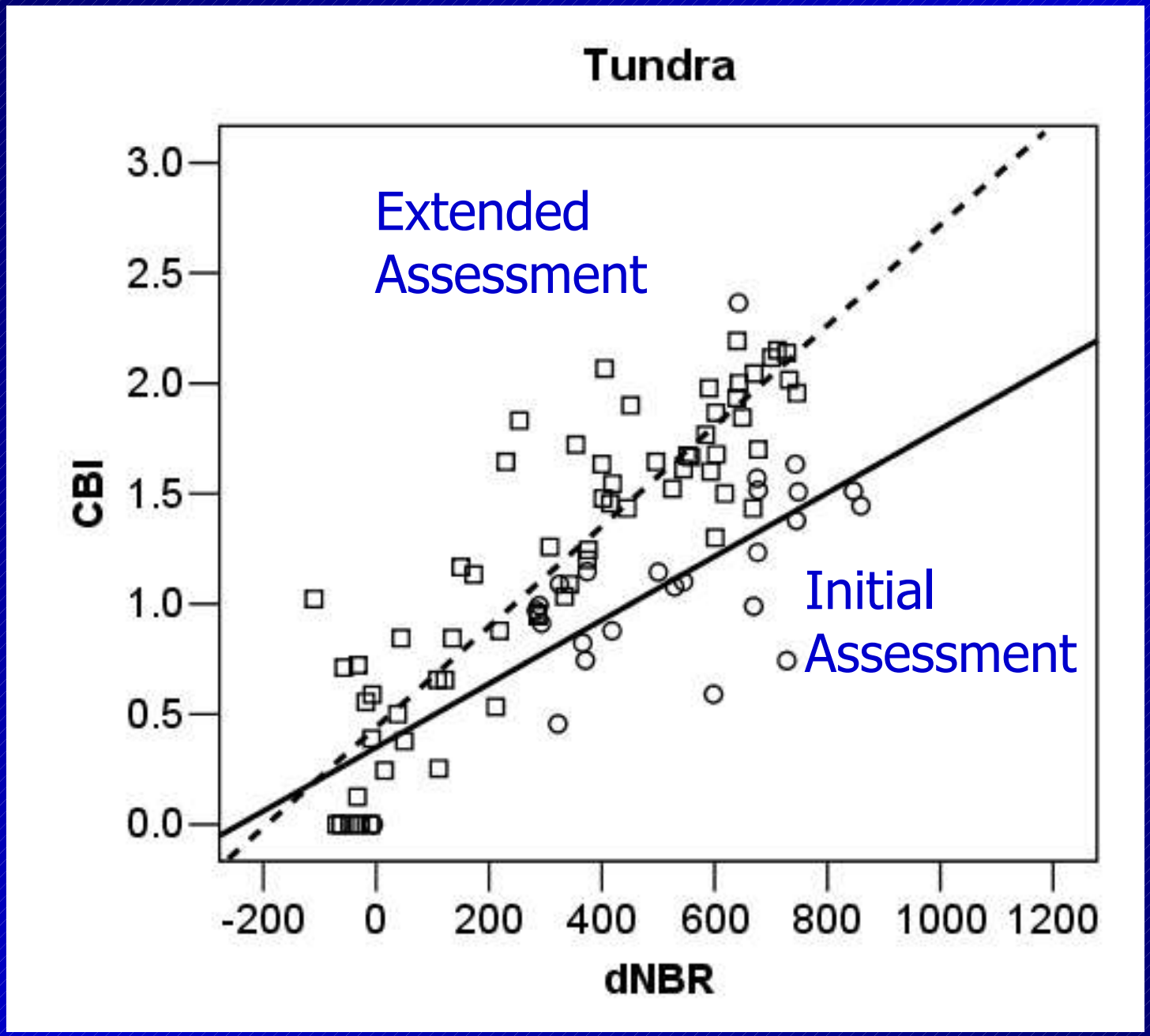
- Significant difference in the average dNBR ($F = 18.69$, $P < 0.0001$) and average CBI values among the vegetation types ($F = 11.27$, $P < 0.0001$)


Comparison by Pre-Fire Vegetation Types
CBI
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-200
0
200
400
600
800
1000
1200
dNBR_analysis
Veg_code_general
BS
DU
TUN
WS
Fit line for BS
Fit line for DU
Fit line for TUN
Fit line for WS
R Sq Linear = 0.593
R Sq Linear = 0.632
R Sq Linear = 0.709
R Sq Linear = 0.724

Veg Results

- White Spruce, $r^2 = 0.58$, highest severity
- Tundra, $r^2 = 0.63$, lowest severity, difference in IA & EA
- Deciduous, $r^2 = 0.68$, low dNBR
- Black Spruce, $r^2 = 0.72$, best fit overall

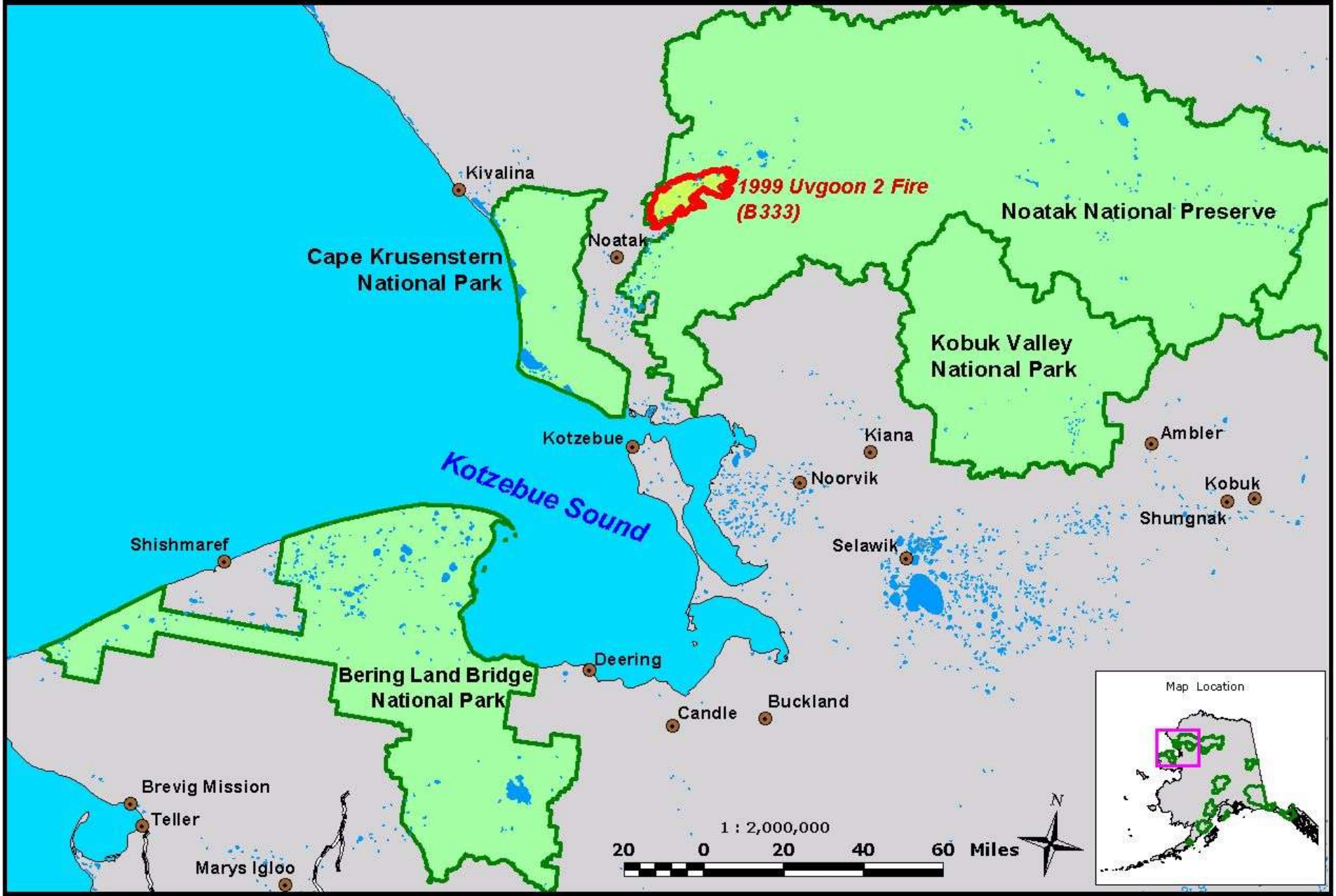



Tundra
Extended Assessment
Initial Assessment
CBI
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-200
0
200
400
600
800
1000
1200
dNBR

Noatak National Preserve

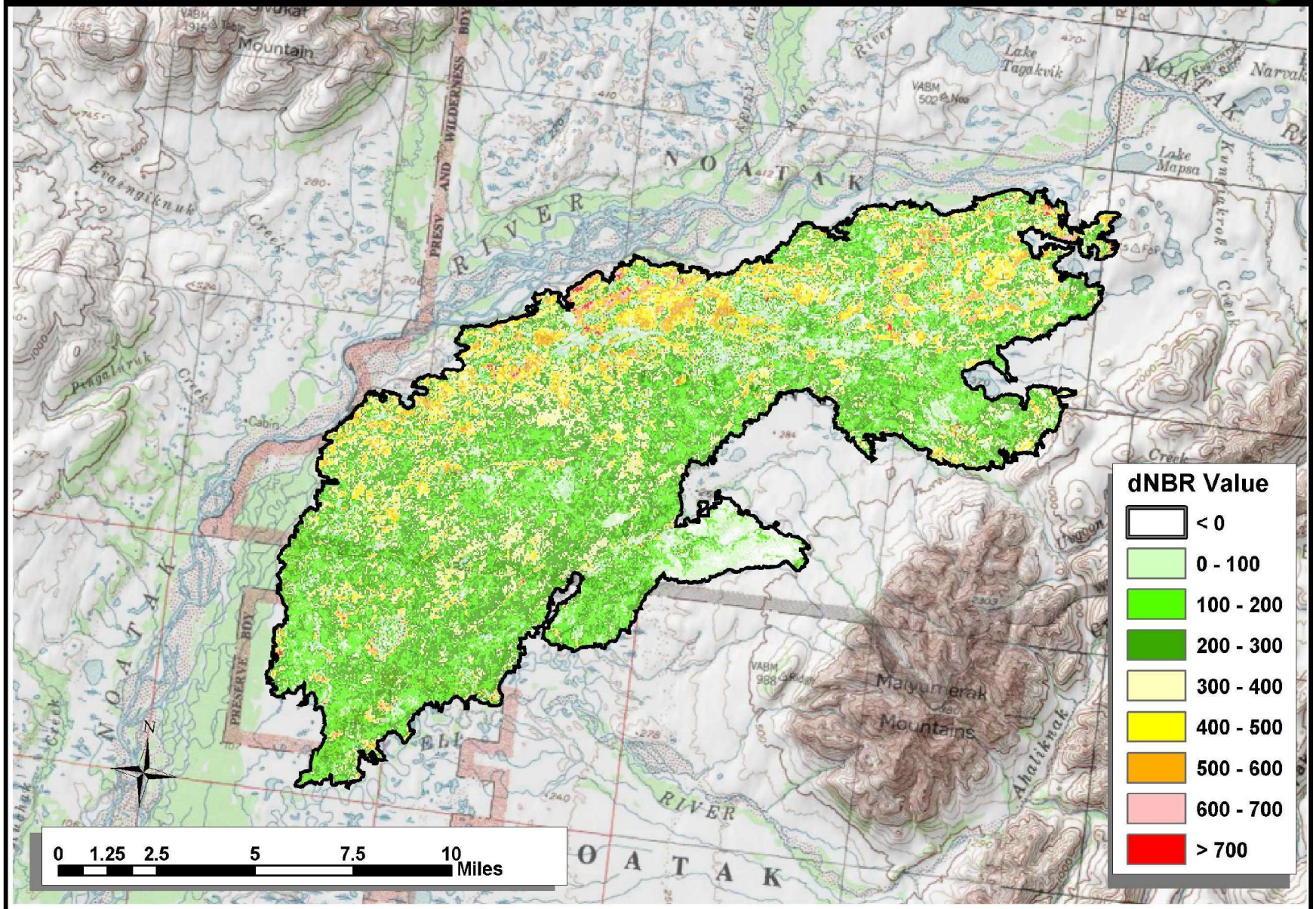
1999 Fires

National Park Service
U.S. Department of the Interior



Noatak National Preserve
1999 Uvgoon 2 fire Burn Severity

National Park Service
U.S. Department of the Interior



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USGS Global Visualization Viewer

Sensor: Landsat 7 ETM+

Select Map Layers

Max CC 100%

WRS-2 Path/Row: 81 12 Go

USGS

Scene Information:

ID: 7081012000219950

Cloud Cover: 3%

Date: 2002/7/18

Jul 2002 Go

Prev Scene Next Scene

1000m 240m

Landsat 7 ETM+ Scene List

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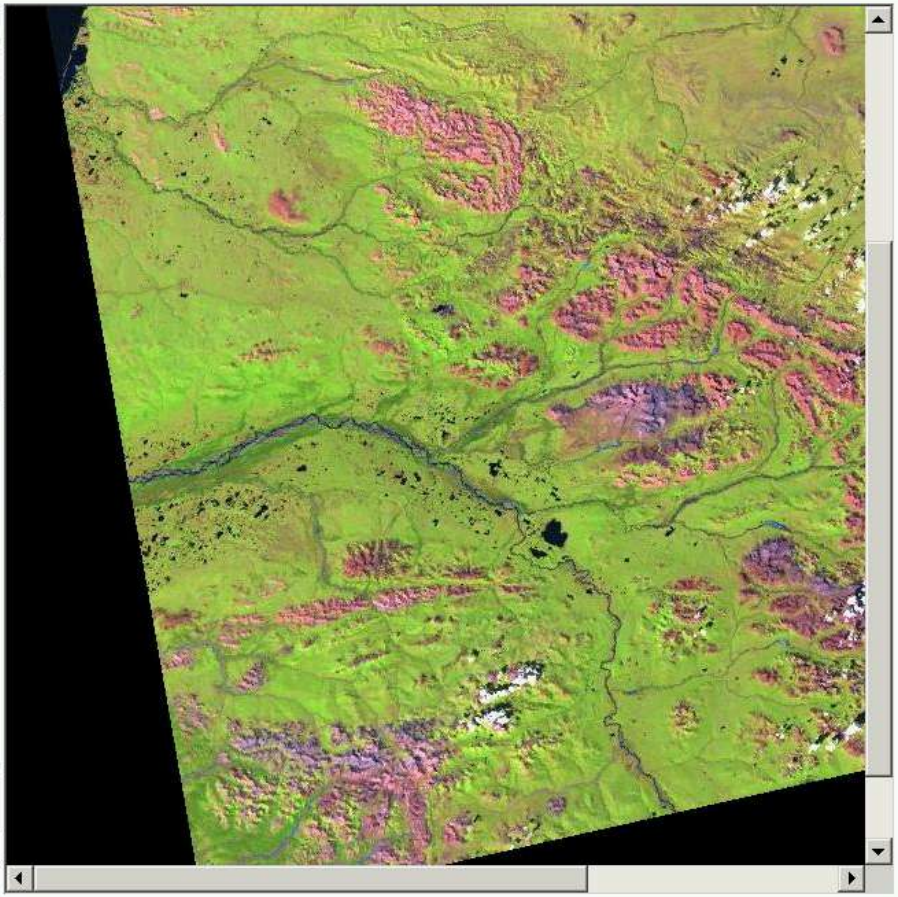

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Uses of dNBR in NPS Alaska

burnseverity_highpower_creek.mxd - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

1:250,000 | Editor | Task: Create New Feature | Target: | ThemeManager | AlaskaPak | Generate Grid | Drawing | Arial | 10

Layers

- 20050914_1200_Highpower_Creek_AKDI
- FirePerimeters
- 20050914_1200_Highpower_Creek_AKDI
- hicr05ap
- Alaska Parks Outline
- jun1702_72-15_refl.img
  - RGB
  - Red: Layer_6
  - Green: Layer_4
  - Blue: Layer_3
- majfilt0211
- high_ia_dnbr
  - Value
  - -2,001 - 0
  - 0 - 100
  - 100.0000001 - 200
  - 200.0000001 - 300
  - 300.0000001 - 400
  - 400.0000001 - 500
  - 500.0000001 - 600
  - 600.0000001 - 700
  - 700.0000001 - 800
  - 800.0000001 - 900
  - 900.0000001 - 1,000
  - 1,000.000001 - 1,500
- DRG Mosaic 1:63,360- DENA
- d711608020905
- SEP1405_71_16_REFL.TIF
  - RGB
  - Red: Band_6
  - Green: Band_4
  - Blue: Band_3
- AUG1302_71_16_REFL.TIF
  - RGB
  - Red: Band_6
  - Green: Band_4
  - Blue: Band_3

Display | Source | Selection | Map Book

38262.00 1528640.46 Meters

burnseverity_highpower_creek.mxd - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

1:250,000 | Editor | Task: Create New Feature | Target: | ThemeManager | AlaskaPak | Generate Grid | Drawing | Arial | 10

Layers

- 20050914_1200_Highpower_Creek_AKDI
- FirePerimeters
- 20050914_1200_Highpower_Creek_AKDI
- hicr05ap
- Alaska Parks Outline
- jun1702_72-15_refl.img
  - RGB
  - Red: Layer_6
  - Green: Layer_4
  - Blue: Layer_3
- majfilt0211
- high_ia_dnbr
  - Value
  - -2,001 - 0
  - 0 - 100
  - 100.0000001 - 200
  - 200.0000001 - 300
  - 300.0000001 - 400
  - 400.0000001 - 500
  - 500.0000001 - 600
  - 600.0000001 - 700
  - 700.0000001 - 800
  - 800.0000001 - 900
  - 900.0000001 - 1,000
  - 1,000.000001 - 1,500
- DRG Mosaic 1:63,360- DENA
- d711608020905
- SEP1405_71_16_REFL.TIF
  - RGB
  - Red: Band_6
  - Green: Band_4
  - Blue: Band_3
- AUG1302_71_16_REFL.TIF
  - RGB
  - Red: Band_6
  - Green: Band_4
  - Blue: Band_3

Display | Source | Selection | Map Book

39426.17 1500859.15 Meters

Untitled - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

1:275,000 | ThemeManager | Spatial Analyst | Layer:

100% | AlaskaPak | TOPO! Pro for ArcGIS | Editor | Layer:

Editor | Task: Create New Feature | Target: | DNRGarmin Menu | Open DNRGarmin | FirePak

Layer: Fires- Historic Wildland | 500

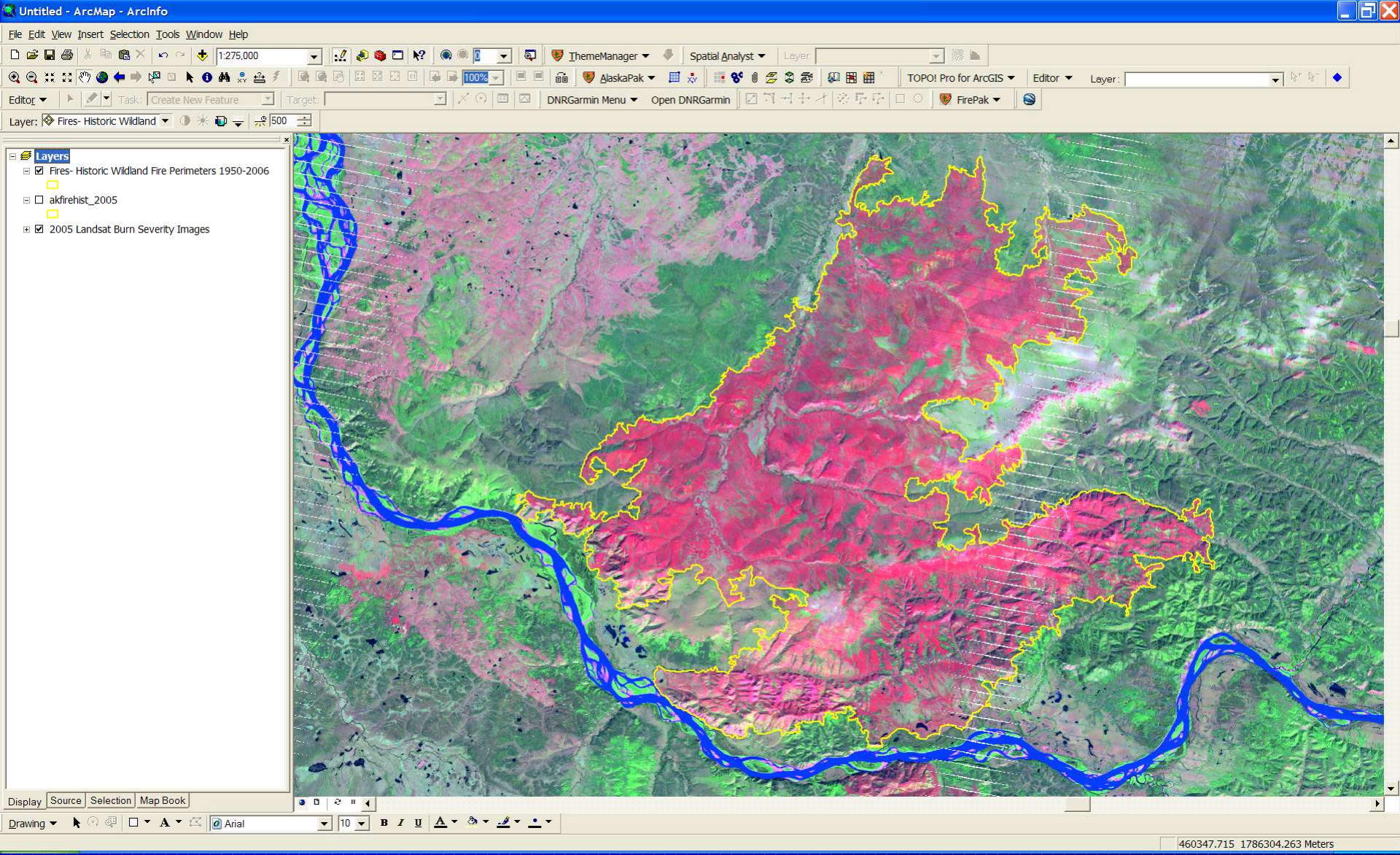
Layers

- Fires- Historic Wildland Fire Perimeters 1950-2006
- akfirehist_2005
- 2005 Landsat Burn Severity Images

Display | Source | Selection | Map Book

Drawing | Arial | 10

456622.374 1785256.51 Meters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TOPO! Pro for ArcGIS
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DNRGarmin Menu
Open DNRGarmin
FirePak
Layer: Fires- Historic Wildland
500
Layers
Fires- Historic Wildland Fire Perimeters 1950-2006
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Display
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Map Book
Drawing
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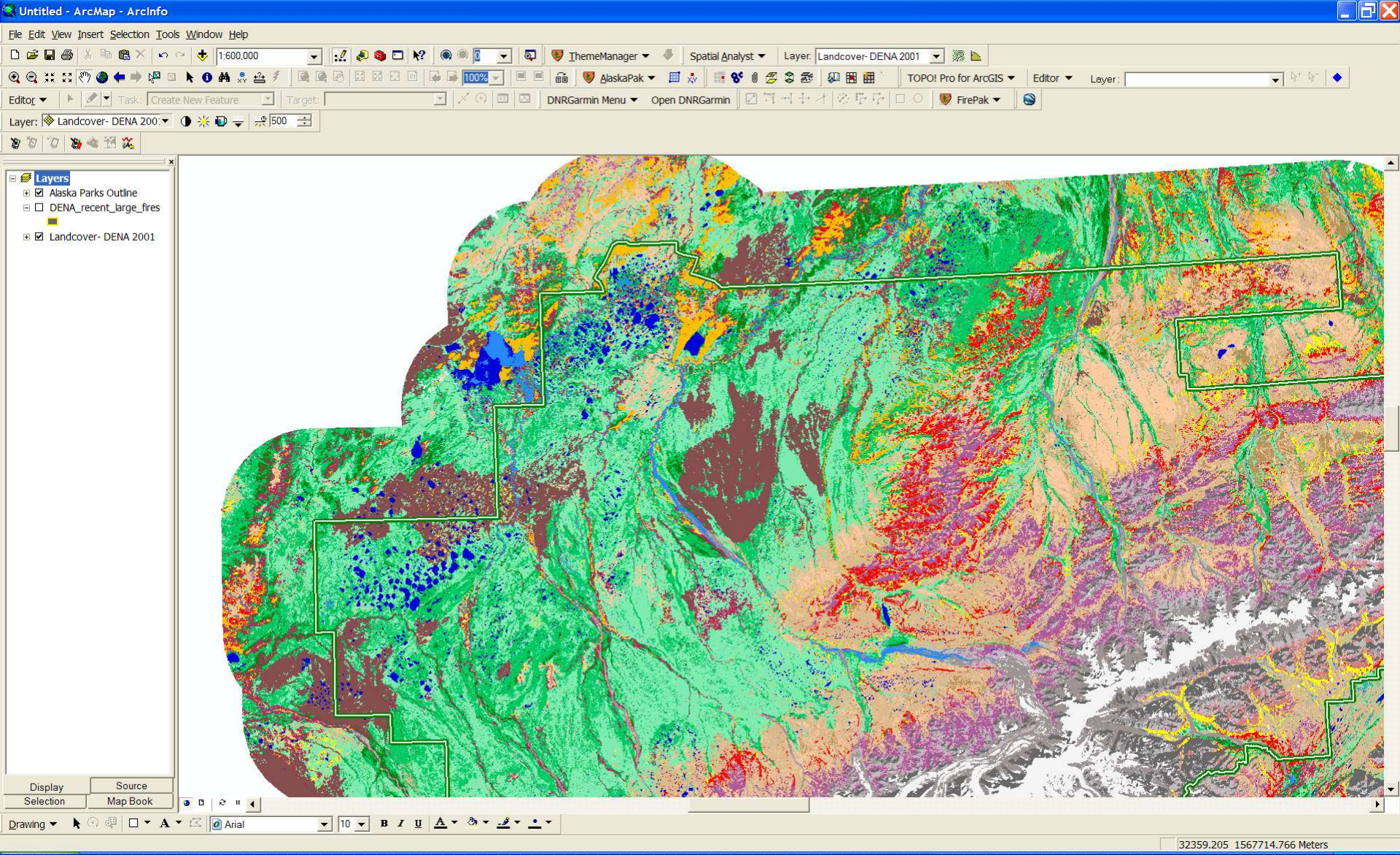
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Editor
Task: Create New Feature
Target:
DNRGarmin Menu
Open DNRGarmin
FirePak
Layer: Landcover- DENA 200
500
Layers
Alaska Parks Outline
DENA_recent_large_fires
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Display
Source
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Map Book
Drawing
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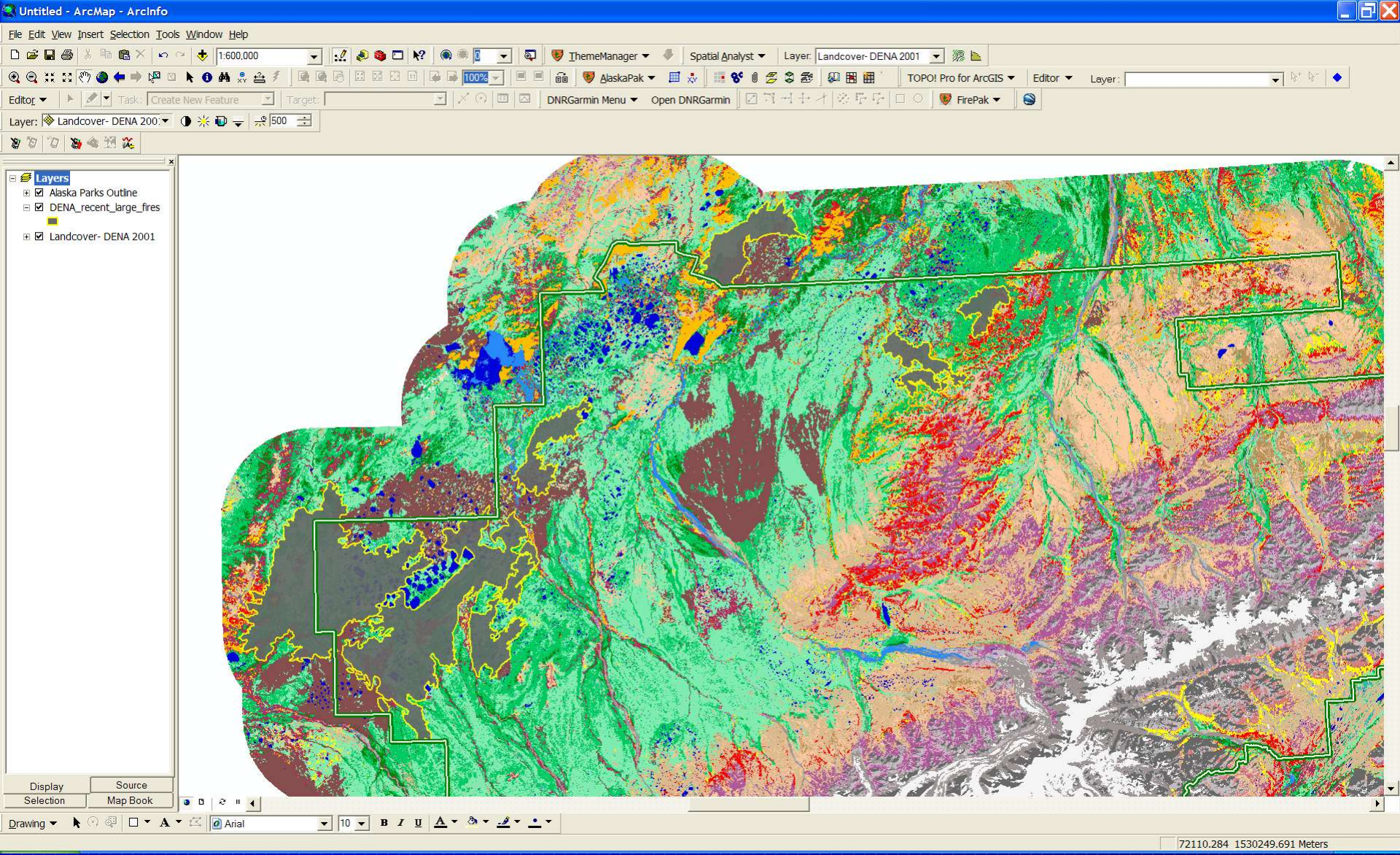
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Open DNRGarmin
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DENA_recent_large_fires
Landcover- DENA 2001
Display
Source
Selection
Map Book
Drawing
Arial
10
72110.284 1530249.691 Meters