

# COMPOSITE BURN INDEX (CBI) PHOTO SERIES

## Central – South Dakota, Ponderosa Pine Forest



The Composite Burn Index (CBI) Photo Series uses plot photos and data to illustrate the range of burn severity encountered across ecosystems of the U.S. We selected examples from over 2,500 plots and 85 fires, spanning very low to very high degrees of ecological change from fire. The series offers managers and scientists a way to calibrate their field interpretations, providing a sense of what the CBI represents visually on the ground. It also provides insight into the variety of fire effects and combinations of effects that make up the overall post-fire condition on a site. One can see that low and high severity conditions may be relatively distinctive and consistent, while there are many possible ways involving different combinations of dissimilar levels of effect that can end up in the moderate range of severity overall. Hence, mid-range CBI values often translate into variable and broader ranges of possible conditions that may be more difficult to interpret. This poster covers the 2000 Highland Creek and Jasper fires in South Dakota that were field sampled in 2002 by National Park Service and USGS crews.

Carl Key, USGS Northern Rocky Mountain Science Center; Nate Benson, NPS Fire Management Program Center; Scott Lang, NPS Glacier. 2007.

The CBI is a field rating (0.0 to 3.0) of burn conditions averaged over a site. It is based on averaging 4-5 rating factors within Understory (A. - C.), Overstory (D. - E.), and over all strata (A. - E.) to rate the Total Plot.

Jasper Fire 2000  
2002 Plot 55 CBI = 0.60



100% burn with light charring of understory and low impacts over all strata. Low 30% consumption of litter and duff. Consumption of down fuels 25%. Small 10-15% change in soil cover and color. Regenerated forbs and grasses dominate understory. Shrub and small tree mortality is low <20%. Predominantly green overstory trees show small <5% of scorch-girdle. Young Ponderosa Pine community.

**PLOT 55**

A. Substrates	1.14
B. Vegetation < 1 m.	0.20
C. Vegetation 1-5 m.	0.80
D. Intermediate Trees	0.08
E. Big Trees	N/A
Understory CBI	0.79
Overstory CBI	0.08
Total Plot CBI	0.59

Jasper Fire 2000  
2002 Plot 72 CBI = 1.10



80% burn with light charring of understory throughout. Moderate understory scores offset very low overstory effects. Consumption of litter and duff 45-60%; down fuels 55%. 30% increase in soil cover. Regenerated forbs and grasses dominate understory with some patches of colonizers. Sapling tree mortality is 100% leading to highest score in stratum C. Green overstory trees have small amount 2% of scorch-girdle. Char height is < 1.5 m. Ponderosa Pine community.

**PLOT 72**

A. Substrates	1.96
B. Vegetation < 1 m.	1.43
C. Vegetation 1-5 m.	2.00
D. Intermediate Trees	0.18
E. Big Trees	0.20
Understory CBI	1.67
Overstory CBI	0.19
Total Plot CBI	1.08

Jasper Fire 2000  
2002 Plot 83 CBI = 1.79



100% burn with a range of strata scores averaging out to moderate. High charring of understory throughout; consumption of litter and duff 95%. High consumption of down fuels > 30%, deep char. 70% increase in soil cover and some color change. Small patches of colonizing grasses and forbs. Intermediate tree mortality is 90%; upper canopy tree mortality is only 10%, most all of it from scorch-girdle. Mixed-age Ponderosa Pine community.

**PLOT 83**

A. Substrates	2.94
B. Vegetation < 1 m.	1.50
C. Vegetation 1-5 m.	2.00
D. Intermediate Trees	1.50
E. Big Trees	0.75
Understory CBI	2.32
Overstory CBI	1.13
Total Plot CBI	1.79

Jasper Fire 2000  
2002 Plot 48 CBI = 2.57



Consistent 100% burn with high charring throughout. High litter and duff consumption > 98%, with >80% increase in soil cover. High consumption of down fuels > 40%, deep char. Small pockets of colonizing grasses in understory. Overstory tree mortality is 100%, almost all from torch-char. Mid-age Ponderosa Pine community.

**PLOT 48**

A. Substrates	2.76
B. Vegetation < 1 m.	1.03
C. Vegetation 1-5 m.	3.00
D. Intermediate Trees	2.86
E. Big Trees	3.00
Understory CBI	2.35
Overstory CBI	2.96
Total Plot CBI	2.57

Jasper Fire 2000  
2002 Plot 33 CBI = 2.75



Consistent 100% burn with high charring throughout. High consumption of litter and duff > 98%, with > 90% increase in soil cover with color change. High consumption of down fuels > 50%, deep char. Very few small patches of mostly colonizers in understory. Overstory tree mortality is 100%, all torch-char with notable branch consumption. Mid-age Ponderosa Pine community.

**PLOT 33**

A. Substrates	2.96
B. Vegetation < 1 m.	1.97
C. Vegetation 1-5 m.	3.00
D. Intermediate Trees	3.00
E. Big Trees	N/A
Understory CBI	2.70
Overstory CBI	3.00
Total Plot CBI	2.75

Highland Creek Fire 2000  
2002 Plot 9a CBI = 0.77



85% burn with light charring throughout. Substrates have highest score at 1.4, all others are quite low. 45-55% consumption of litter, 25% for duff. Consumption of down fuels < 15%, shallow char. Small 5% change in soil cover and color. Regenerated forbs and grasses dominate understory. Shrub and small tree mortality is a low 10%. Overstory tree mortality is < 2%, about 5% of crowns scorched. Young ponderosa pine community.

**PLOT 9a**

A. Substrates	1.40
B. Vegetation < 1 m.	0.65
C. Vegetation 1-5 m.	0.58
D. Intermediate Trees	0.70
E. Big Trees	0.35
Understory CBI	0.94
Overstory CBI	0.52
Total Plot CBI	0.77

Highland Creek Fire 2000  
2002 Plot 1a CBI = 1.00



95% burn with light charring throughout. Low consumption of litter and duff 30-60%. Consumption of down fuels 30%. Small 2% increase in soil cover. Regenerated forbs and grasses dominate understory with some patches of colonizers. No overstory tree mortality, slight basal scorching of some crowns. Mid-age ponderosa pine community type.

**PLOT 1a**

A. Substrates	1.02
B. Vegetation < 1 m.	1.30
C. Vegetation 1-5 m.	N/A
D. Intermediate Trees	N/A
E. Big Trees	0.63
Understory CBI	1.14
Overstory CBI	0.63
Total Plot CBI	0.95

Highland Creek Fire 2000  
2002 Plot 7a CBI = 1.40



95% burn with moderate charring throughout. Moderate-high consumption of litter and duff 70%. Consumption of down fuels 20%. 20% increase in soil cover. Some patches of colonizing grasses/forbs, otherwise mostly regenerating pre-fire vegetation in understory. Overstory tree mortality is 60%, almost all due to scorch-girdle, 40% green. Ponderosa Pine community type.

**PLOT 7a**

A. Substrates	1.54
B. Vegetation < 1 m.	1.23
C. Vegetation 1-5 m.	N/A
D. Intermediate Trees	N/A
E. Big Trees	1.43
Understory CBI	1.43
Overstory CBI	1.43
Total Plot CBI	1.43

Highland Creek Fire 2000  
2002 Plot 10a CBI = 2.00



90% burn with moderate-high charring of understory throughout plot. High >80% consumption of litter and 60-70% duff. 30% consumption of down fuels. Moderate increase in soil cover. Patches of colonizing grasses in understory, about 70% regenerating pre-fire species. Overstory tree mortality is 90%, 60% scorch-girdle with fallen needles, 35% torch-char, <10% green. Mid-age ponderosa pine community type.

**PLOT 10a**

A. Substrates	1.64
B. Vegetation < 1 m.	1.87
C. Vegetation 1-5 m.	N/A
D. Intermediate Trees	2.17
E. Big Trees	1.98
Understory CBI	1.73
Overstory CBI	2.08
Total Plot CBI	1.90

Highland Creek Fire 2000  
2002 Plot 3a CBI = 2.70



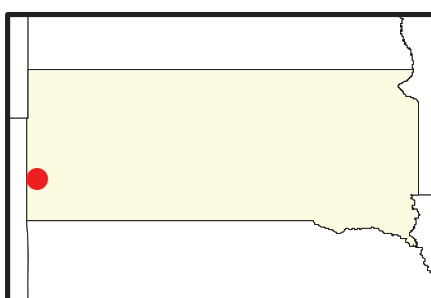
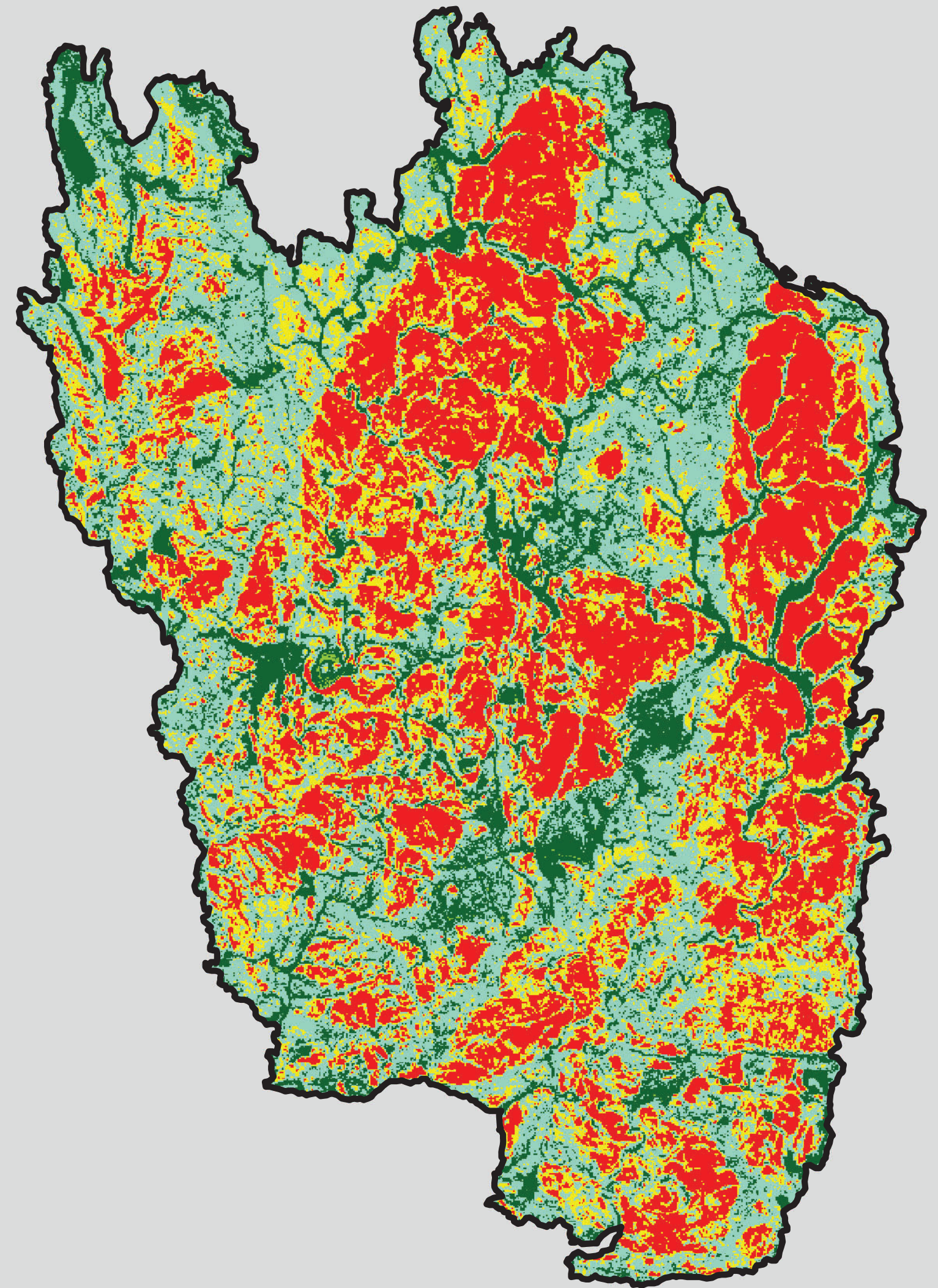
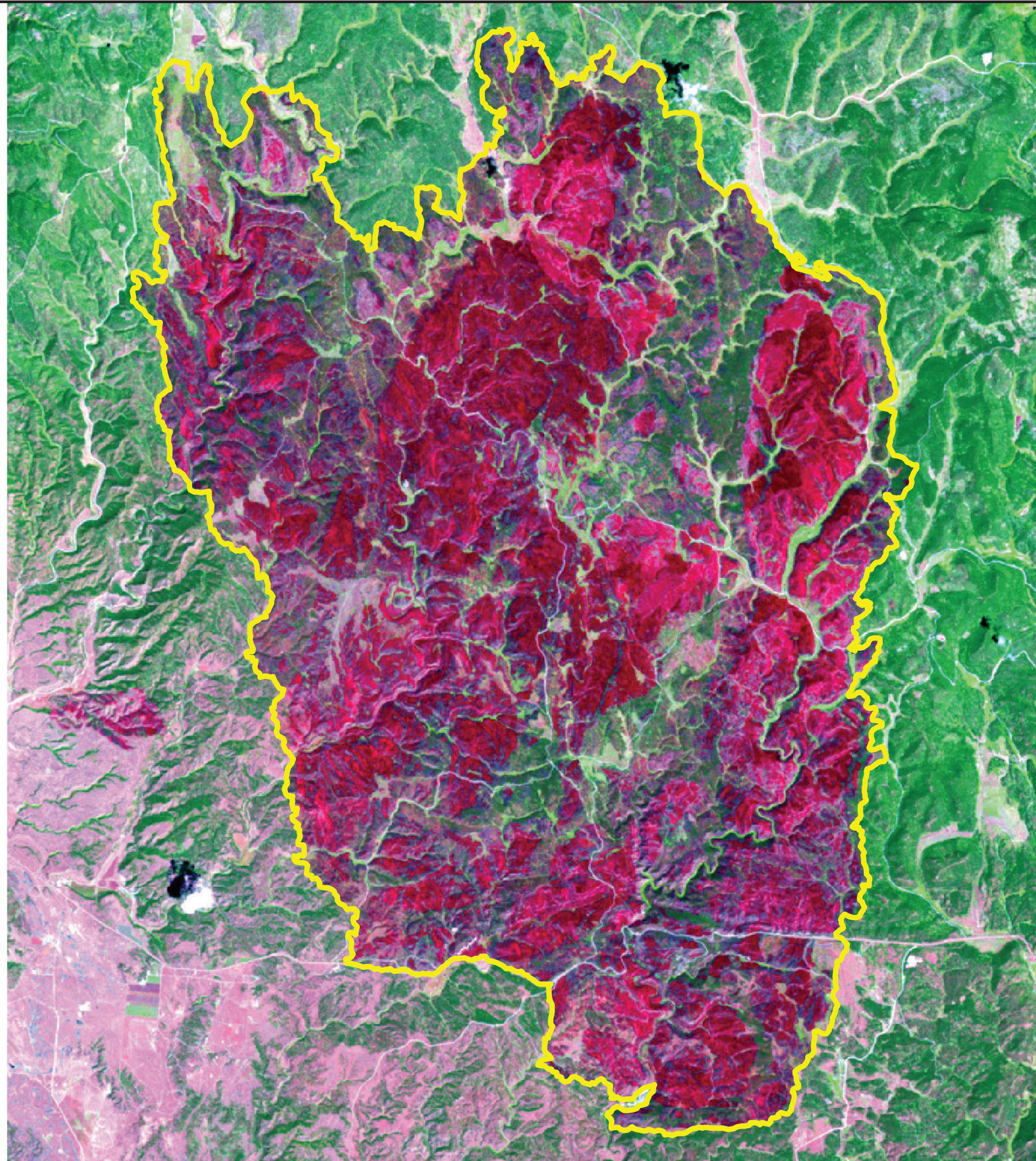
Consistent 100% burn with high charring throughout. High consumption of litter and duff > 95%. High consumption of down fuels > 50%. Moderate 35% increase in soil cover and change in color. Patches of mostly colonizing grasses/forbs in understory. Shrub and small tree mortality is 100%. Overstory tree mortality is 100%, almost all due to torch-char with fine branch consumption. Young ponderosa pine community type.

**PLOT 3a**

A. Substrates	2.34
B. Vegetation < 1 m.	2.23
C. Vegetation 1-5 m.	3.00
D. Intermediate Trees	3.00
E. Big Trees	2.87
Understory CBI	2.53
Overstory CBI	2.93
Total Plot CBI	2.67

# 2000 South Dakota: JASPER

sd4381510387820000824



Latitude: 43° 48' 54.0"  
 Longitude: -103° 52' 40.8"  
 Fire Ignition Date: August 24, 2000  
 Assessment Type: Extended  
 Pre-Fire Image Date: June 02, 2000 (Landsat 5)  
 Post-Fire Image Date: June 05, 2001 (Landsat 5)



## Acreage of Burn Severity

Burn Severity	Acres
Unburned to Low	12,747
Low	28,652
Moderate	17,031
High	23,717
Increased Greenness	151
Non-Processing Area Mask*	0
<b>Total</b>	<b>82,299</b>

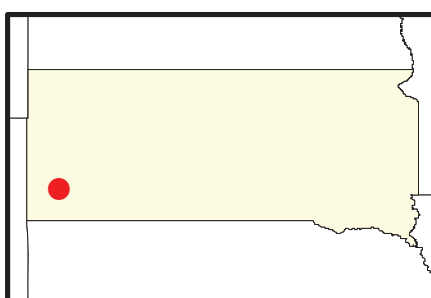
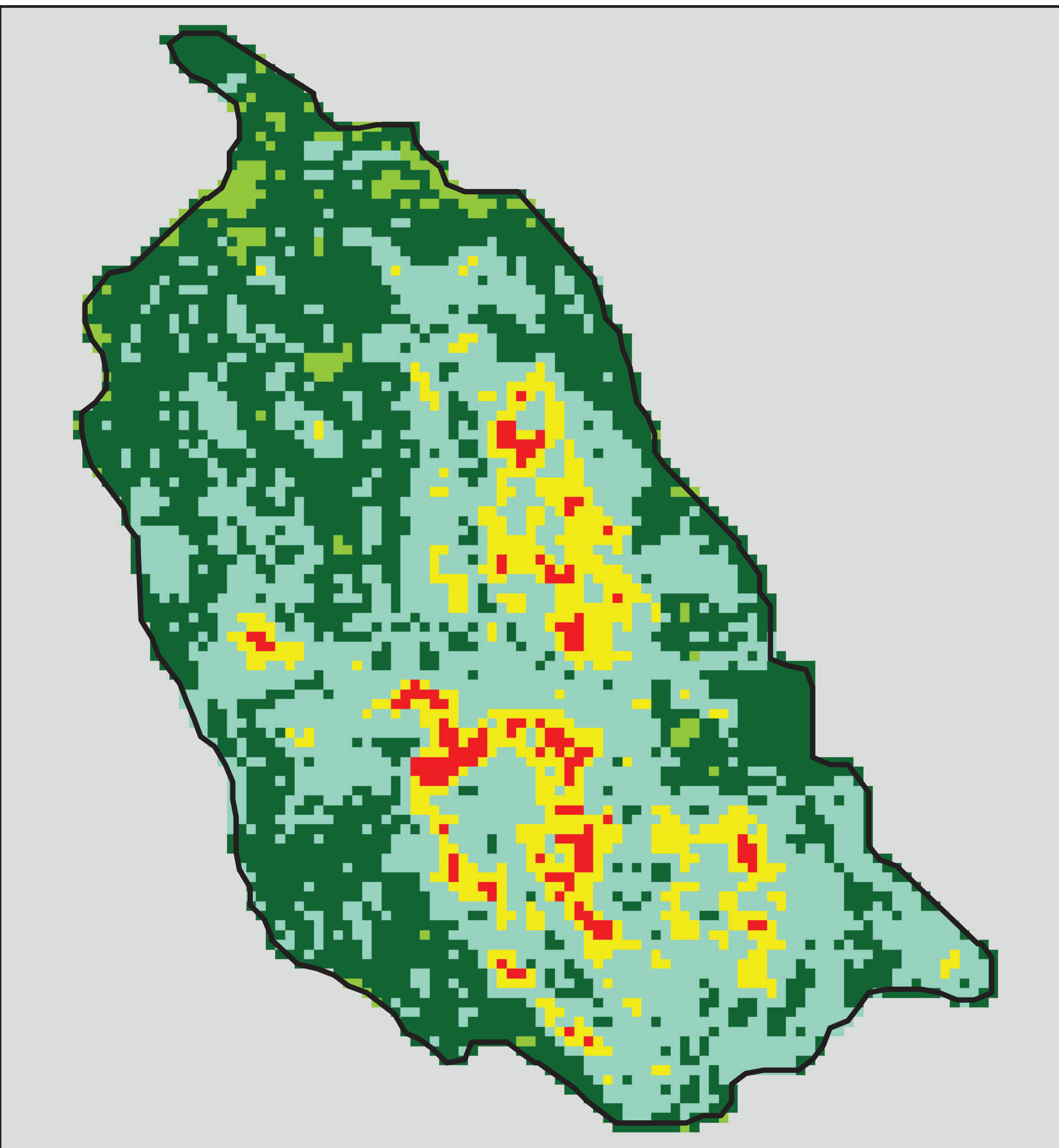
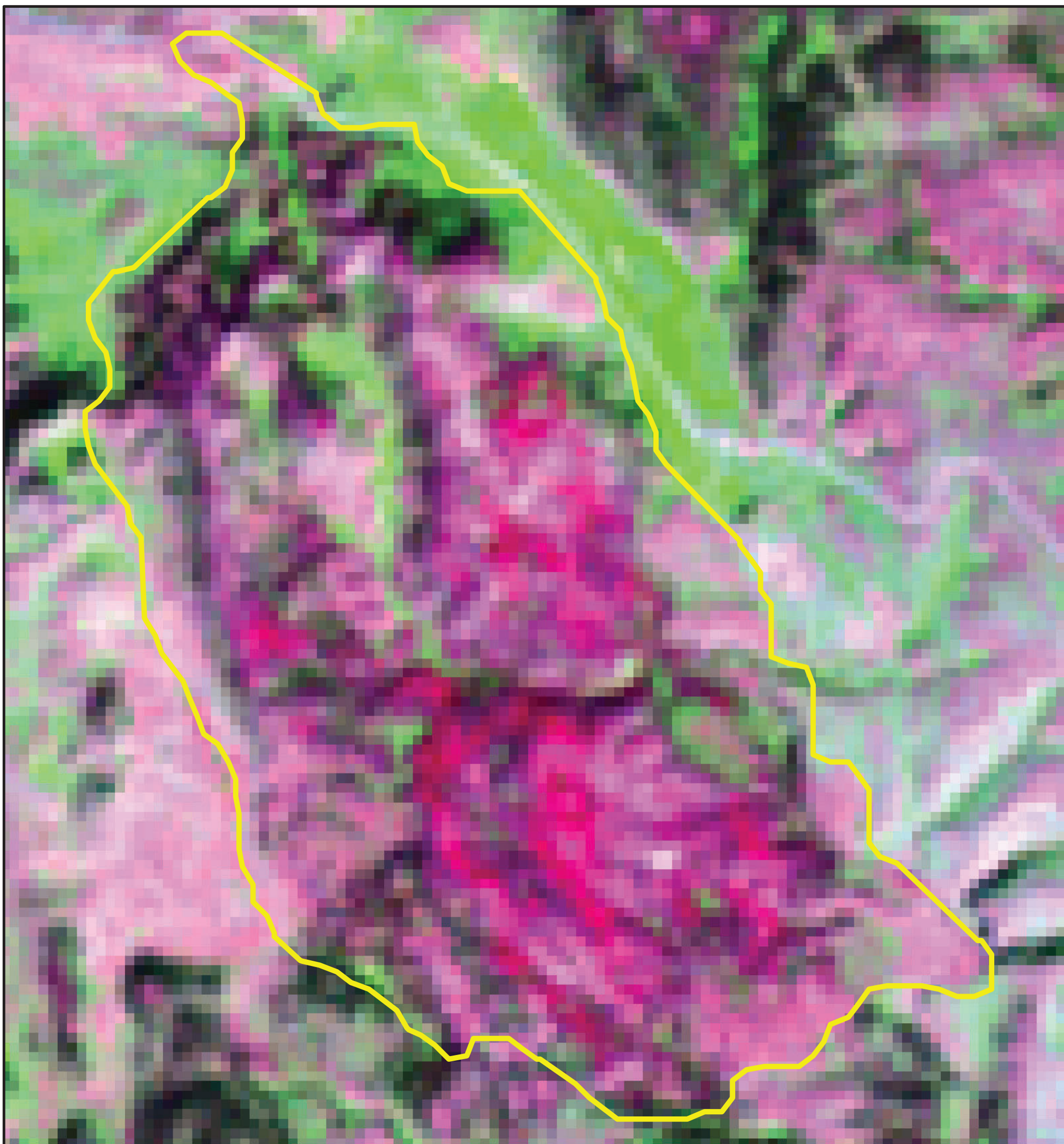
This map portrays fire severity for the fire specified in the map title and summarizes proportions of fire severity classes. These data are produced under the Monitoring Trends in Burn Severity (MTBS) project jointly implemented by the USGS EROS and the USFS RSAC. The MTBS project ascertains the locations of fires based on available fire occurrence information provided by federal and state agencies, and other reliable sources. The MTBS project reserves the right to correct, update or modify geospatial inputs to this map without notification.

\* Areas in either the pre-fire or post-fire reflectance imagery containing clouds, snow, shadows, smoke, significantly sized water bodies, missing lines of image data, etc.



# 2000 South Dakota: HIGHLAND CREEK

sd4362410344920000714



Latitude: 43° 37' 26.4"  
 Longitude: -103° 26' 56.4"  
 Fire Ignition Date: July 14, 2000  
 Assessment Type: Extended  
 Pre-Fire Image Date: July 12, 2000 (Landsat 7)  
 Post-Fire Image Date: August 16, 2001 (Landsat 7)



Acreage of Burn Severity	
Burn Severity	Acres
Unburned to Low	511
Low	552
Moderate	138
High	31
Increased Greenness	30
Non-Processing Area Mask*	0
<b>Total</b>	<b>1,262</b>

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